NOTE ON AGRICULTURE IN JAPAN. . .

BY

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On Deputation, Madras Fisheries Investigation.

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CONTENTS.

PREFACE.

THE following Note is the outcome of a tour in Japan in 1906 undertaken primarily to study certain features of Fishery practice and organisation in that country. The observations on agricultural practice made in various parts of the southern districts shared my note books with those on fishery practice, and the papers perused and translations obtained in consequence of those observations have induced me to place them on record in view to assist, in however small a way, the ryot and reformer, the agriculture and the rural economy of the Presidency in which my service has been passed.

In the Preface to my Note on Fisheries I have already expressed my obligations to the various gentlemen who made my way smooth by kindly assistance; to the acknowledgments there expressed must be added my cordial thanks to the Authorities and Professors of the Central Agricultural Experimental Station at Tokyo, to those of the Agricultural College at Komaba, and to those of the several Experimental Stations and Agricultural Schools which I visited, in all of which the most ungrudging help by oral explanation, by the gift of papers, and by personal guidance through their institutions, was freely given. My sincere thanks are also due to the Prefects of Aichi, Mito, and Kanagawa for interviews and other assistance.

It is difficult to enumerate the books and papers consulted for this Note; "Japan in the beginning of the 20th Century" published in 1904 by the Department of Agriculture and Commerce, has of course been of great assistance, and the Statistical and explanatory

reports issued by the several departments have furnished me with both figures and facts; such are the Financial and Economic Reports of Government, in English and French, the very detailed statistical reports of the Department of Agriculture, especially the 21st report (1906), and other official papers in Japanese specially translated for me; also reports and bulletins of the Central Experimental Station and the Agricultural College. Books or papers such as Rein's "Industries of Japan," Dr. Shinkizi Nagai's paper on Japanese agriculture translated from the German into French and printed in the "Annales de la Science Agronomique" (1887), Dr. Ono's "Industrial Transition in Japan," Dr. Maron's notice of Japanese agriculture, and scattered notices in the "Asiatic Transactions" such as the papers by Messrs. Simmons and Wigmore and by Mr. Kinch, and in travels such as those of Alcock, Davis, Fortune, Kaempfer, Thunberg, etc., found in the Congressional Library at Washington and in the British Museum, have been used both for original descriptions and for confirming and amplifying my own observations.

But the most fertile source of written or printed information on what I have called the "New System" in Japan, that is the modern system of organisation, of education, of State assistance, and of popular self-help, have been the translations which Mr. S. Fujita of the College of Science, Tokyo, has laboriously made for me and which I have freely used in this part of my note; in my next visit to Japan in October I hope to amplify by personal observation at first hand the information given on Agricultural Associations and other rural organisations and methods of help. A list of the translations will be found in an Appendix.

YERCAUD,
31*st March* 1907.

F. A. NICHOLSON.

ERRATA TO NOTE ON AGRICULTURE IN JAPAN.

Page 5, *footnote, line* 9 *from top.—For* "crops are" *read* "crops is".

Page 6, *line* 8 *from top.—For* "pen" *read* "peu".

Page 6, *line* 26 *from top.—For* "has" *read* "have".

Page 17, *line* 37 *from top.—For* "agriculturists" *read* "agriculturist".

Page 23, *footnote, line* 10 *from top.—For* "ones" *read* "ones,".

Page 23, *footnote, line* 20 *from top.—For* "country" *read* "county".

Page 25, *line* 25 *from top.—For* "Japanico" *read* "Japonico".

Page 30, *line* 22 *from top.—For* "on the furrows" *read* "in the furrows".

Page 57, *line* 25 *from top.—For* "bones to the fish" *read* "bones of the fish".

Page 58, *line* 30 *from top.—For* "collection" *read* "removal".

Page 58, *line* 33 *from top.—For* "sun fortunately deodorizes" *read* "sun deodorizes".

Page 61, *line* 28 *from top.—For* "Hence" *read* "Hence,".

Page 61, *line* 29 *from top.—For* "constituents" *read* "constituents,".

Page 62, *line* 27 *from top.—For* "lixiviun" *read* "lixivium"

Page 67, *line* 2 *from top.—For* "fresh" *read* "dry"

Page 71, *footnote, line* 23 *from top.—For* "improvement" *read* "the improvement".

Page 96, *line* 23 *from top.—For* "only second" *read* "only third".

Page 97, *line* 26 *from top.—For* "come," *read* "come".

Page 101, *line* 8 *from top.—For* "practical work," *read* "practical work, *viz.*".

Page 101, *line* 12 *from top.—For* "Rs. 320;" *read* "Rs. 320,"

Page 101, *line* 12 *from top.—For* "subsidies were also given to lower grade associations" *read* "subsidies to lower grade associations".

NOTE

ON

AGRICULTURE IN JAPAN.

GENERAL.

THE following Note on Japanese Agriculture simply deals with a few matters which *necessarily* strike an observer accustomed to land and cultivation questions in an Indian ryotwari province; it has been drawn up from notes taken on personal observation and enquiry during a ten weeks (April to June) stay in the country, supplemented by information culled from scattered writings and notices, from laws, rules, and reports, chiefly by or in Japanese, and mostly now translated for the first time.

2. *General conditions.*—The main point is this; we see in Japan a country under "*petite culture*" which deliberately isolated herself from the outer world for many centuries, its intercourse with China and Korea having been but slight, especially in recent times, and practically *nil* with other countries until the latter half of the 19th century; trade and industries were small and purely local and domestic. Hence it obtained no advantage or supplies *ab extra*; it was wholly self-contained, and was necessarily fed solely from its own resources. The arable area is extremely small, and its population relatively large, yet it has fed this population satisfactorily, has reared a sturdy race, has paid very high rentals to a non-labouring or leisured class, has kept its soils not only unexhausted but fertile, and has done all this without imported food or manure, almost without cattle, and wholly without any mineral or "artificial" fertilisers even from within its own borders. The facts brought out in this Note show minute culture, large yields, heavy rentals, dense population; what are the secrets which have enabled a country of petty cultivators, poor, isolated, unorganized, ignorant, devoid of cattle, and usually rack-rented, to produce good and regular crops, and withal to increase the fertility of their soils? The

answer will be found in the manuring and tillage systems necessarily adopted; on the one hand the utilization of all waste both in matter, space, and time, and on the other persistent, dogged, strenuous labour; it is not capital or agricultural education, or government aid, or imported food and fertilisers, which have hitherto fed Japan, but the utilization of those substances and forces which are or may be available in greater or less degree to every Indian farmer. Professor Baldwin long ago said—broadly of course—that the Irish peasant farmer could in general double his produce without extra capital, simply by the use of more labour more diligently and intelligently applied; it is this strenuous, intelligent labour—intelligent even if only in traditional methods—which regards no useful substance as abhorrent, avoids no toil that may be fruitful, which has both fed Japan and has educated and stiffened its people.

3. *Modern changes in conditions.*—But this hitherto self-sustained society has with extreme suddenness entered upon a new era; and while physically unable to increase readily, or even to any great extent, its cultivable area, it has begun so rapidly to add to its population, that it is being forced to adopt new methods in its agriculture, methods which have been accepted promptly and intelligently by its people; one of the most remarkable phenomena in a remarkable race is the responsiveness of the masses, even before education had spread, both to the changing conditions of the country and to the suggestions or orders of its authorities. The following table shows succinctly the problem to be faced. Formosa is excluded here and throughout this Note.

Year.	Population.	Area under cultivation.	Increase of population per cent.	Increase of cultivated area per cent.	Area of cultivation per head.	Population per 1000 acres of cultivation.	Remarks.
		ACRES.			ACRES.		
1828 ...	27,200,000	...	...	...	...	...	
1872 ...	33,110,793	10,465,270	...	...	0·316	3,164	
1895 ...	42,270,620	12,342,034	27·6	18·0	0·292	3,425	
1905 ...	47,812,702	12,778,124	13·1	3·53	0·267	3,743	

4. *Object of Note.*—The object of this note is to show, first how the old agriculture has hitherto sufficed for large current

needs, secondly some of the methods adopted so to develop the old agriculture as to meet rapidly changing conditions.*

5. But Japanese agriculture, its successes and difficulties, cannot be adequately understood without a knowledge of its conditioning circumstances, favourable or hostile, while false inferences might easily be drawn if due weight is not given to those facts which differentiate Japan from Madras. Hence a few general remarks are necessary on climate, soils, land economics, and the like.

Climate.

6. Probably climate is the most important of all natural conditioning circumstances on agriculture, not merely in its direct action on vegetation but in its influence on the people. The Japanese climate is peculiarly suited to agriculture except in the colder parts of the north; the seasons are extremely regular, spring and spring weather occurring in due time, and giving

* As the present paper is written for Madras perusal, the following explanations are necessary:—

Ken = Prefecture, District or Collectorate; 46 in number besides Hokkaido.

Shi = City, or municipality, being urban sub-divisions of a prefecture; 60 in number.

Gun = County or taluk, being the rural sub-divisions of a prefecture; 638 in number.

Cho = town not being a city; 1,121 in number.

Son = Village or commune; 12,388 in number.

Rice land = Wet or irrigated land (nanjei).

Upland = Dry, unirrigated land (punjei).

Cho = 2·45 acres (practically a hectare, 2·43 acres).

Tan = 0·1 cho or ·25 acre.

Koku = 40 gallons (liquid), or 5 bushels 1·8 hectolitres (grain measure), or 40 kwam by weight of rice.

Kwam = 8·25 lb.

Kin = 1·32 lb.

Bushel = 45 lb. paddy; 65 lb. husked rice.
60 lb. wheat.
50 lb. barley.

Seer = 2 lb.

Maund = 82⅔ lb. (10 kwam).

Yen = 2s. 0½d. usually taken in round figures as $\frac{1}{10}$ of £1 sterling or Rs. 1-8.

Sen = $\frac{1}{100}$ of a yen, or one farthing, or three pies.

The statistics in this report are not always correct to minute fractions, except where such fractions are of importance as in calculating the quantity of nitrogen, etc. in manures. Statistics vary so greatly from year to year and even, to a considerable extent, in the several statistical reports, that small fractions are generally useless especially in gaining general ideas and merely cumber the text and the memory. For example, the yen except where fractions are important, is taken as 2 shillings or Rs. 1-8-0 instead of 2-0½ or 1-8-6, the koku as 5 bushels instead of 4·962, and the kwam as 8·25 lb. instead of 8·267. The cho, however, has always been taken at its exact figure of 2·45 acres, slightly above the hectare of 2·48 acres.

place to a warm summer with its accompanying rains in due season, and this again is followed by the dry harvest months of late autumn, and by a bright and cold winter when vegetation generally rests. In round figures the rainfall is between 50 and 100 inches according to locality and occurs in every month of the year; drought of any duration or widespread character is almost unknown. Owing to this regular and considerable rainfall, and to the island position of Japan with its immense coast outline, the air is nearly always humid especially in the hot months June–September, which are the period of the heaviest rains but yet enjoy abundant sunshine, so that rice—the mainstay of Japanese food—thrives luxuriantly. From March to October sun and rain alternate with pleasing and fruitful diversity, while *late* October and November when the summer harvests are being reaped and the land prepared and sown for the spring and early summer crops, are among the drier periods of the year. The following table gives the average rainfall by months, and shows its favourable distribution; it is, however, only for two southern stations.

Average rainfall in Tokyo by months for the period 1875–1902, *and the rainfall in Tokyo and Osaka in* 1904 (*in inches*).

Place.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Tokyo 1875 to 1902.	2·18	2·92	4·36	5·16	6·12	6·68	5·28	4·64	8·20	7·28	4·36	2·24	59·42
Tokyo 1904.	0·28	2·70	4·04	3·88	5·08	3·64	9·6	3·0	8·0	9·96	0·60	3·84	55·22
Osaka 1904.	0·98	1·79	6·20	5·70	5·64	10·40	5·0	4·20	5·92	5·40	0·96	1·72	53·31

Not only so but the configuration of the country aids the rainfall, three-fourths being mountainous or hilly where the rainfall is more considerable than on the plains, so that the whole year round, but especially in the rice growing season, the country is full of rivers and brooks and springs.

7. Mean temperature in Tokyo from 1875–1902 is averaged in degrees Fahrenheit in the following table:—

Place.													
										Oc	ber.	November.	
Tokyo ...	36·86	38·48	44·42	54·32	61·88	68·72	82·58	85·82	71·6	60·44	50·18	41·36	

It will be seen that while the winters are sharp and cold even in the south, and while the air is keen and bracing right up to the end of April, the summer heat is ample for products such as rice, tobacco, maize, sweet potato, cotton, etc., and yet is tempered by the frequent rainfall. For Europeans the summer is trying owing to combined heat and moisture, but for vegetation it seems perfection.*

Soils.

8. A second element in agriculture is the soil, but this can so readily be improved by intelligent labour (little capital is necessary on small farms if labour be cheap, strenuous, and intelligent) that it is ordinarily the least important of the factors. Japan, like Flanders, well illustrates this; the soils by nature are frequently poor; the cuttings on the hill-sides, the appearance of new fields, and the sandy character of seaside areas show this and analysis proves it. Rein says that the geological derivation and constituents of the chief soils of Japan explain their natural poverty especially in phosphoric acid and potash, and that without the most careful attention and manuring they can in most cases produce no very favourable returns; it is only by deep tillage, opening up the ground for aëration, thorough cleaning of the soil, repeated treatment with manure while the crops are growing, and the rational utilization of every scrap or every sort of manure that can be got, that the soils are made to produce as they do. Dr. Shinkizi Nagai says of the vast areas of soils derived from the schistose group that they are of "bad quality", of "low fertility" and productivity, while those derived from volcanic ash and sand are of "very small value." Thunberg who travelled only in the rich southern provinces, stated that "in general the soil of Japan is in itself barren, but in consequence of the labour and manure bestowed on it and a sufficient quantity

* Too much stress must not, however, be laid on climate as favouring a large continuous yield, for such yield, if not otherwise fed, would merely mean soil exhaustion more rapid than if the yield were small; climate does not create crop material but makes soil material available and assists crop to utilize that material, so that unless a soil is infinitely fertile or inexhaustible, good climate might actually hasten arrival of that minimum continuous yield which has been demonstrated on unmanured plots at Rothamsted. Hence where good climate favours large crops, the cultivation system must be such that if permanent fertility with large crops are desired, the material for such crops must be made regularly available *ab extra*. In Japan soils are not generally productive by nature so much as by the cultivation system, and the value of climate is in rewarding the system.

of rain, it is brought to a considerable degree of fertility." Dr. Von Siebold says "the soil is *naturally* sterile, but the labour bestowed on it aided by all the manure that can in any way be collected, conquers its natural defects and is repaid by abundant harvests." Kaempfer said that the soil is "for the most part barren" but "through the indefatigable care and industry of the natives it has been made fruitful"; Charlevoix stated that the country is "assez pen fertile de son propre fond"; Maron and others say precisely the same, always laying stress on the tireless labour bestowed on the soil, and its *consequent* amelioration; Alcock travelling along the south noted the sandy character of the soil, as may be readily seen by travellers, "so much so that nothing but continuous manuring of the most fertilising kind, with all the patient toil of a Japanese population, could have brought it to the crop bearing state;" a Japanese proverb is to the effect that "a new field gives but a small crop." The very latest authority (Chamberlain in "Things Japanese") says of the soil "even the cultivable portion is not highly fertile by nature. It is made so by subsoil working, ... by manure judiciously and laboriously applied," etc. Those who see Japanese fields, like garden beds, of black soft loam, are apt to forget that these soils are largely, in many localities almost wholly, the products of centuries of intelligent care and fertilising, that it is just tireless labour and wise and persistent though empirical manuring, that has made these soils what they are, and one chief object of this paper is to show what the Japanese are able to do with the labour they put into the soil and with the manures they find around them. It cannot be too often repeated that in a country which has been absolutely isolated and consequently thrown upon its own resources, a very poor peasantry without capital or anything except traditional knowledge and traditionally tireless labour has raised what must, over vast areas, have been poor soils to soils of considerable and what is more, habitual fertility, a fertility not exceptional or scattered but similar and continuous, each field resembling its neighbour in characteristics. This has been done without any mineral manures, for up to the present none have been found in Japan and there has been no importation until the last ten or fifteen years; even oilcake from China is a recent introduction, and fish fertiliser, though aggregating what in India would be thought a vast quantity, supplies nutriment to a very small proportion of the crops; cattle manure is necessarily but a small resource where cattle and horses are so few, and sheep, goats and swine practically non-existent; even bones have not been largely used, since they are necessarily scarce.

How these soils are maintained in fertility will be explained under "characteristics of cultivation."

Land Economics.

9. *Area and population.*—The gross area of Japan proper omitting Formosa, is 94,440,500 acres; of this the greater part is mountainous and hilly, and in the north endures a long winter. With all the labour industriously applied during thousands of years only 12,778,124 acres, or 13·53 per cent. of this area, was arable land under cultivation in 1905; the rest is not at present cultivated and by far the greater area never can be; in the south it would seem that almost every foot of the valleys has been already levelled and cultivated, while the hill-sides are terraced in little fields often to their tops. The crops on this small area *plus* fish from the sea and some poultry and eggs, practically feed the whole Japanese nation, for meat, milk, butter, and cheese are not articles of their diet; there is a considerable import nowadays of food stuffs, chiefly rice, flour, and beans, but a good deal is also exported; the average annual net imports from 1895–1905 would not feed the country for two weeks. The population in 1905 was 47,812,702 so that it subsists on an area of 0·267 acres per head, an area which for a self-sustained nation is probably of unparalleled minuteness, though it is said that in tropical Hawaii, one-eighth of an acre of taro coupled with a ration of fish will support an adult; a few years ago the cultivated area of Germany per head was somewhat above one acre, beside which there was about ¼ acre per head of pastures for cattle, and large food imports; in the Madras Presidency (ryotwari area exclusive of the West Coast) the tilled area is about one acre per head. Deducting from the tilled area of Japan that given up to mulberry, tea, etc., the food supply including the enormous amount distilled into spirit (saki), is derived from about 11·8 million acres or less than ¼ acre per head. Yet the Japanese are the reverse of starved; they are particularly strong, sturdy, and well nourished, beggary is hardly existent, and emaciation not visible. If then the diet is not restricted it must be that the produce of the fields is large and is largely supplemented from the sea; there are practically no other food sources. It is, however, to be noted that the population is growing faster than the arable area; in 1872 the population was 33,110,793 and the arable area 10,465,270 acres, or 0·316 acre per head; in 1905 the figures were 47,812,702 and 12,778,124 or 0·267 acre per head, being an increase of 44·4 per cent. and 22·1 per cent. respectively; between 1895 and 1905 the population increased by 13·1 per cent. and the arable area by only 3·53

per cent. Hence the pressure on the Japanese soil, always heavy, is becoming very serious.*

10. *Occupation of land.*—The area occupied per farmer and the nature of the occupancy are of surpassing interest to Madras. Unfortunately, exact present figures for holdings are not known, those (4,420,000) in the returns relating only to 1888 and to only 38 out of 46 districts. Approximately in 1901, 12·3 million arable acres were occupied in above 4·8 million farms, by the same number of families; farms below 2 acres formed 55 per cent. of the whole number, those between 2 and 3¾ acres were 30 per cent., and those above 3¾ acres were 15 per cent.; hence 85 per cent. did not exceed 3¾ acres (1½ cho). The area occupied by each of these three classes is not given, but cultivating occupancies above 3¾ acres cannot cover a very large area since the average occupancy for the country is only 2·55 acres, *i.e.*, about one cho or hectare, and this area tends to diminish as population increases. Hence it is only a good outturn which makes living possible for a rural family averaging 5·8 individuals on the above small area, especially considering the necessary outgoing expenses for rental, taxes and rates; *per contra* it is the smallness of the holding and the pressure on the land which are the chief causes of the excellence of the outturn as shown hereafter under "Characteristics of cultivation."

11. The word "occupancy" or "farm" has been used since tenures differ and there are no exact statistics as to the nature of the tenures; much of the land is held in petty peasant proprietorship, and the remainder in estates, large or small, *cultivated* in minute

* It remains for the philosophic historian to explain the extraordinary fact disclosed by the census returns in Japan, viz., that in a country absolutely free throughout its long history from foreign invasion and from emigration, the population at the end of the centuries of isolation (1872) had but reached the total of 33·1 million while in the next 33 years it rose by fairly steady annual increments to 47·8 million, an increase of 44·4 per cent. The increase is apparently not nominal due to improvements in enumeration, for censuses were well known before 1872, Japanese accuracy in political matters is great, and, with some occasional fluctuations, the increase has been steady at about 1·3 per cent. per annum. Nor is the increase due to the development of industrialism since this is of very recent growth and is still comparatively slight. The recent increase appears still more remarkable on considering earlier figures such as 26·1, 25·9, 26·06, and 27·2 million in 1744, 1750, 1751, and 1828 respectively, figures which show a stationary population, with, however, an increment between 1828 and 1872 (44 years) of 5·9 millions or 21·7 per cent. just 0·5 per cent. per annum. In India the causes of stationary and retrogressive population up to about 1801 when the people of the Madras Presidency, and probably of India generally, numbered a bare third of those in 1901, are sufficiently obvious in the continuous ravages for centuries previous of internecine war, pestilence and famine, but the problem in Japan, unless similar causes prevailed prior to 1872 or at least 1828, affords a curious sociological study.

It is for the far-seeing statesman to predict the result of the present rapidity of increase of population.

farms by tenant occupiers. Accounts of the areas held by the larger landlords have not been obtained; that there are many large landholders and estates is known and many nobles and others live on and for their estates, and look after their numerous tenants; apparently it is these who are the chief members of the Central Agricultural Society of Japan, a purely private society, independent of Government, with its head-quarters at Tokyo, and a membership of over 8,000. As for the actual cultivators it is on official record by the Department of Agriculture that in 1888, in 38 out of 46 districts there were 1,470,000 independent farmers (peasant-proprietors, ryots) and about 2,000,000 who cultivated partly as owners, partly as lessees; about 950,000 more were wholly tenant-farmers. The areas respectively held are not stated but it will be seen that tenants and part-tenants are twice as numerous as the peasant-proprietors. As found in Madras, wet lands are leased more largely than uplands, 68 per cent. of the tenants cultivating the former and only 32 per cent. the latter; this is the general tendency everywhere, due to the greater productiveness of the wet lands.

12. The Departmental comment in 1904 on the above facts is noteworthy:—

"As matters have become less favourable since that time for small freeholders, the ratio of tenant-farmers and tenant farms must have grown more. Indeed, the condition of tenant farming is far from being satisfactory, for according to the investigations made in 1887, out of ten parts of the products of paddy-fields throughout the country the land-owners obtain about six and the tenant-farmers only four, while in regard to the upland fields the relative ratio was four and-a-half parts and five and-a-half respectively. The steady increase of population at a rate far beyond that of tillage land, constitutes an important factor in keeping the rents high, for tenant-farmers are obliged from sheer necessity to compete for leases, and in raising of course the rents as the natural result of their competition. In extreme cases the share of harvest that falls to the lot of the tenant-farmers is barely sufficient to pay the cost of the manure applied to the fields.

"Such being in general the condition of our tenant-farmers, in most cases they are obliged to depend on tillage and the labour of their own families, while the limited funds they have at their disposal for getting fertilisers or farm implements, further hampers them in their work. Under these circumstances, they find it hard to keep up with the progress of the times, and this hard lot is also shared by small free-holders. But the evil does not end here, for our farming classes which constitute 60 per cent. of the whole population, are steadily increasing in number, so that

those who can afford to do so are migrating to cities and towns. In view of this circumstance both the Government and the general public are doing their best to improve the mode of tillage, to encourage the use of labour-saving machines and devices, and also to provide various conveniences to encourage their settlement in unexploited places. It may safely be expected that the condition of our farmers will become much better in the near future than it is now."

13. In a paper of 1890 by Dr. Ono who mentions a similar proportion of tenant-farmers, it is stated that the lease systems are by no means moderate especially in the case of estates owned by the quondam retainers of the late Shogunate. He gives the *average* rental in some provinces as 24 bushels of rice * per annum and quotes to the effect that in some districts "four-fifths of the crop go to the owner of the land, and from the one-fifth remaining, all the cost of cultivating and harvesting must be obtained"; such excessive payments are naturally the cause of much hardships and the author calls for "some kind of legal (legislative ?) interference."

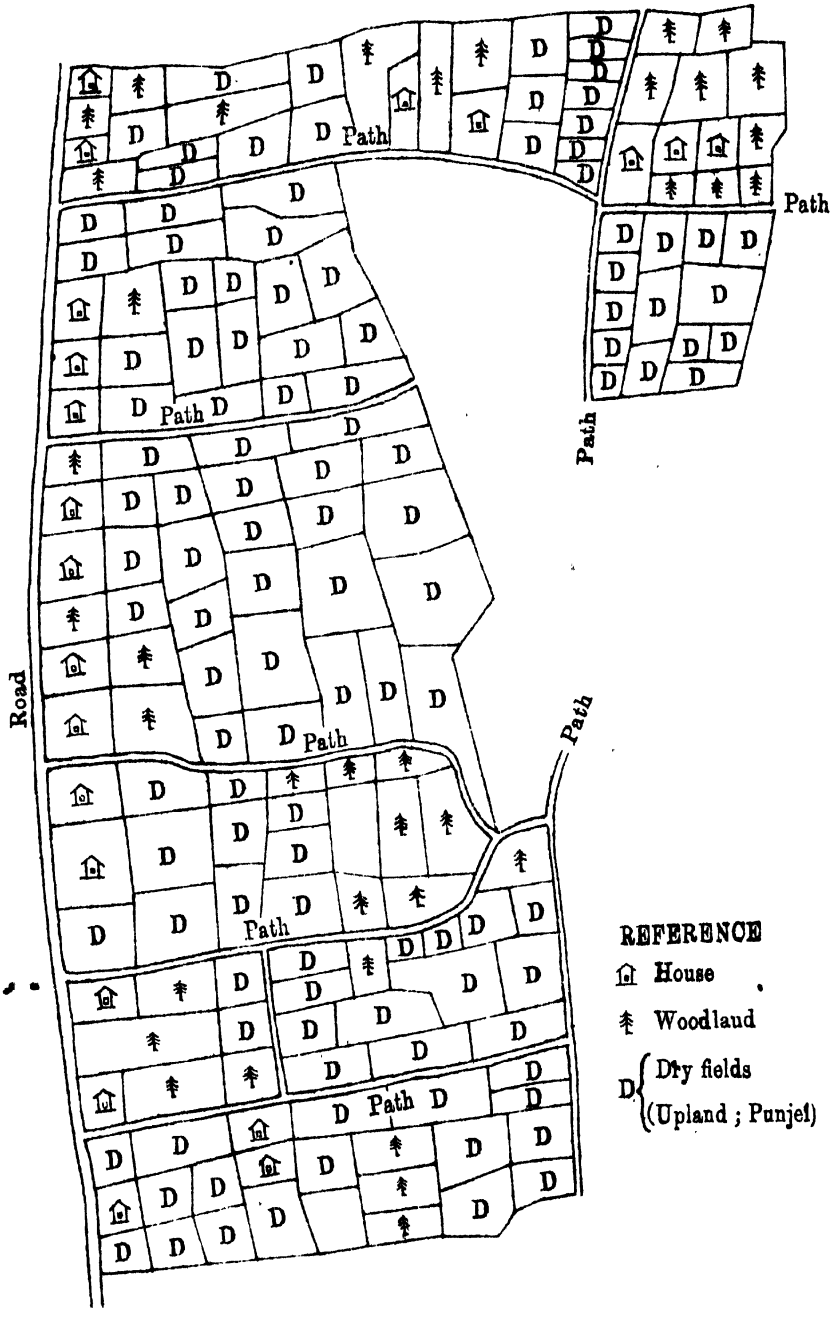
14. These extracts are of the highest interest to those who have studied Madras conditions of cultivation; the (so-called) tenant question is being dealt with in Madras by a special law but the "sub-tenant," the cultivator who holds from the Government ryot, is at present ignored, and yet it is on him that a vast amount of cultivation depends and it is his weakness that causes much not only of bad and pauper cultivation and of the distress due to bad crops, but of the general inability to grow superior crops in places eminently suited for them just because of his want of capital and of his inability to wait for a deferred crop. There is much more also that may be deduced from the above notable extracts.

15. Not only are the farms small but they are broken into much smaller and scattered plots; the lots as registered in the land records average $\frac{1}{10}$ acre for wet lands and $\frac{1}{8}$ for dry lands, but in practice these are further subdivided so that "the real extent of each lot does not exceed $\frac{1}{20}$ of an acre."

These plots are very irregular in shape and much wet land is lost by the banks (varappu) between the fields and much inconvenience caused in cultivation. There are however no hedges or walls or fences of any sort. To regain part of the space wasted

* Throughout this report the word "rice" is the translation of "genmai," *i.e.* commercial rice cleaned from the husk but not finally whitened for the table. "genmai" is estimated by the Japanese at 50 per cent. by volume of the paddy.

ONE UPLAND BLOCK (KHANDAM) OF A JAPANESE VILLAGE



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and to lessen the inconvenience caused a law has been passed, as in Germany, to facilitate adjustments of holdings by mutual exchange and consolidation (Verkoppelung) of plots and by recasting boundaries; parties are already at work carrying out the law.

16. In a note on "Land Tenure and Local Institutions in old Japan" by Messrs. Simmons and Wigmore ("Asiatic Transactions," Vol. XIX, part I) details are given of a village. The total area of this village was 215 acres, of which 18·4 were rice land (a very small area), 111·5 were uplands (punjei) 14·7 house site, 55·6 forest, 12·25 roads, paths and boundary banks, and 2·50 were meadow, graveyard, and temple lands. This area was held by 80 owners in 86 holdings which were subdivided into 564 lots; some of the holdings were less than half an acre, many less than one. The rice land lay in a shallow valley surrounded by the higher levels or low hills on which were the upland fields and woods, just as may be seen anywhere on the West Coast of Madras. The sketch map shows the upland fields and forest patches intermingled; there were 114 forest patches, each therefore averaging half an acre, mostly separate but in many cases contiguous so as to form a considerable block of wood or scrub jungle; they also adjoined the house sites even on the sides of the main road. The house sites occasionally formed homesteads amongst the uplands, but mostly bordered the main road. A rough sketch of one of the upland blocks (khandams) is appended.

17. *Settlement.*—A note of the above nature would be wholly incomplete without a sketch of the relations between State and landholder. The ancient system was fluctuating, uncertain, and everywhere different; for centuries before the Restoration of 1867 the country was broken up into feudal baronies, the lords of which levied the land tax on their own account and used the proceeds chiefly for their military organisation, so that the land tax was rather a tenant's rental varying from "30 per cent. to 70 per cent. of the gross produce of the fields." The cultivators had no real private ownership, for they could neither buy nor sell land nor, since rice was the invariable medium of payment, were they allowed to grow what crops they pleased, the barons or their agents interfering to force the cultivation of rice even on unsuitable land; they held moreover "by a very precarious tenure," while the rate of tax for the year depended on the reports of the barons' agents, so that there was fixity in no sense of the word; land left waste was liable to transfer to some other tenant. After the Restoration, when the feudal barons, by an act of renunciation only paralleled by the renunciation of power by the Shoguns, wholly relinquished their fiefs to the Sovereign,

one of the earliest acts of the new Government was to place the land and its assessment on a proper footing.

18. First, the land was divided into public (State) and private land, and private land, exclusive of certain untaxed porambokes, was declared to belong to the holders subject only to the payment of the land tax, and all restrictions on the class of cultivation were removed. This did away with the uncertainty of tenure and gave over for ever to the holders 34,967,230 acres, all of which except 1,220,749 acres of porambokes (school land, shrine premises, cemeteries, enbankments, etc.), are taxable. Included in this area are all arable lands under cultivation (figures are for 1901), viz., 12,360,930 acres, 17,144,049 acres of private forests, 2,634,354 acres of "plain and pasture," 942,336 acres of dwelling land (house sites and yards) and other smaller items, all of which are taxed; the unoccupied taxable land is only 570,188 acres and this is exempted "for some years" from taxation as are also the lands, scanty in area, newly reclaimed from waste. The public (State or Court) land, viz., 52,397,272 acres, apparently includes no cultivated or arable land since the statistical returns describe the cultivated area and the outturn of crops as from the taxable private land only; it consists of Court demesnes, mausolea, shrines, etc., State forests (nearly 34 million acres) and moors, public parks and Government premises. There are also 7,075,798 acres of what may be called public porambokes not included under either private or State lands, viz., highways, lakes and backwaters, and so forth. Altogether these three categories make up the 94,440,300 acres of land which form the total area of Japan.

19. The above "private" land belongs to its registered owners precisely as Madras ryotwari land belongs to the ryots; it can be devised, inherited, mortgaged, transferred by gift or purchase (except to aliens), cultivated or left waste, at the pleasure of the owners; only it must pay the fixed Government assessment. The word "fixed" is used in the land tax law as by Munro in 1824, viz., fixed as distinguished from fluctuating in every year and locality. Until the Restoration in 1867 the assessment was paid in kind, but in rice only; whatever crop was cultivated its value was commuted at varying rates to rice and that only was received in payment; moreover "the tax gatherers of each feudal Government (that of the Daimios) inspected every year the condition of the harvest in the dominions of the Government and determined the rate of tax payable for the year; there was no fixed rate," but it varied from place to place and from time to time ("Japan, 20th century"). Rein says that in 1595 the land tax was decreed at $\frac{1}{3}$ of the gross produce payable in rice, and the produce of groves, forests, mountains, and rivers was to be included but still

paid in rice; in 1716 the legal demand was raised to $\frac{1}{3}$, and when Alcock wrote in 1862 it was said to rise to $\frac{6}{10}$. In an official report of 1904 it is stated that before the Restoration the land assessment or tenants' rental paid to the barons was not uniform except that it was uniformly excessive and ranged "from 30 per cent. — 70 per cent. of the yield of the field." After the Restoration the land tax was placed on a money basis; from 1872–1881 a general settlement was carried on and the assessment was then "fixed" at a "fixed" rate of 3 per cent. (reduced later to 2·5 per cent.) of the *capital* value of the land and a revision was to be made every six years. This later provision was not strictly carried out, but since the condition of the land is constantly changing, readjustments have repeatedly been made since 1882 by comparing the actual conditions with the entries in the official land registers" (Fifth Financial Annual, 1905), and with a view to equitable readjustments a reassessment was carried out in 1899. Not only so but this "fixed" assessment while subject if necessary to reduction is also liable—much more liable—to a sudden and arbitrary enhancement of the percentage (temporary at all events) such as Munro advocated when, as he said, war or the exigencies of Government required it to be raised; *e.g.*, from 1899 to 1903 it was raised "from 2·5 to 3·3 and even to 5 per cent. according to the class of land" on account of charges in the late Chinese war; it was then reduced to the old rate but again enhanced enormously during the war with Russia. The special law of 1904 amended in 1905 with retrospective effect over 1904, raised the land tax as follows; on urban building land by 17·5 per cent. of the assessed (*capital*) value, on rural building land by 5·5 per cent., and on other (agricultural) land by 3 per cent. of that capital value in *addition* to the ordinary land tax of 2½ per cent.; in other words the land tax was raised by 700, 220 and 120 per cent., respectively. As explained below, the assessed capital value was originally placed low and, owing to the great rise in prices and to the vast increase in the value of urban land by the growth of the cities and of industries therein, values are now far greater than the assessed value, so that the normal land tax probably represents little more than 1 per cent. of the real capital value even of agricultural land; otherwise it is inconceivable that so heavy a burden as a raising of the land tax by "120 to 700 per cent." (Financial Annual for 1905) could be borne even for two years. Still the fact remains that a "fixed" assessment was raised at a stroke in this enormous proportion. The special law provides that it shall be repealed "on the last day of the year following that in which peace shall have been restored," but it seems unlikely that the tax will fall to its normal rate considering the needs of State and the great increase in real values of land.

20. The settlement process was peculiar; briefly, the capital value of the land was everywhere estimated, the original classification of the land, its sale-price, and its average produce for the preceding five years, being main factors in settling the assessment, while its fertility, local circumstances, markets, and other matters were also duly considered; 11·77 per cent. of this value for wet lands and 11·29 for dry lands were then taken as the value of the gross produce of an average harvest and this percentage was distributed as in the table below, cases of average value, viz. 531 yen per cho (Rs. 325 per acre) for rice land and 207 per cho (Rs. 125 per acre) for dry lands, being taken as examples :—

Item.	Wet (rice) land, Rs. 325 per acre.		Dry land, Rs. 125 per acre.	
	Per cent.	Per acre.	Per cent.	Per acre.
		Rs. A.		Rs. A.
State tax	2·5	8 2	2·5	3 2
Local rates	2·5	8 2	2·5	3 2
Cultivation expenses ...	2·77	9 0	2·29	2 14
Net profit	4·0	13 0	4·0	5 0
Total ...	11·77	38 4	11·29	14 2

The account and figures in this paragraph are based upon Rein's account, and are confirmed by remarks in Mayet ("Agricultural Insurance") and Le Gendre. These give 11·67 and 11·65, respectively, as the ratio of the gross annual produce to the capital value of the land.

21. The value was obtained "by taking the average of the actual yield of each piece of land during five years and estimating it at the average price of grain prevalent in the locality during the same period. The sum thus obtained was capitalized and accepted as the basis of taxation" (Dr. Ono), apparently at 25 years purchase of the net profit. The weight of the assessment was later on decreased by reducing the valuation of the land which was considered to be above market prices. Taking 100 as representing the value of the crop, then the State assessment represented 21·24, the local land rates 21·24, cultivation expenses 23·53, and net profit 34 per cent. of the value. Mayet, apparently wrongly, calculates farming expenses at only 15 per cent. As the local land rates were afterwards reduced to an ordinary proportion of $\frac{4}{11}$ of the State assessment ($\frac{1}{3}$ for prefectural and

¼ for village rates), these local rates would correspond to about 10 per cent. and the net profit would therefore be increased by 11 per cent. The assessment and local rates are however now quite different in actual and relative amounts and proportions as will now be shown.

22. These, then were the yields, values, rates and amounts of assessment, cost of cultivation, and net profits accepted as correct and equitable by the Japanese Government in 1881 at the then prices. But since 1881 prices have greatly risen, so that the crop value is far higher than that given above; hence the assessment bears a much lower proportion to capital value than the original 2·5 per cent. The price per bushel in 1881 is not known but in 1887 when prices had already risen, "husked" rice was selling at Rs. 7 per koku (5 bushels), in 1896 it had steadily risen to Rs. 13–12–0, and in 1903 medium quality rice was selling at just below Rs. 20. In other words, since the "normal" outturn of husked rice is over 6 koku (30·7 bushels) per acre, the value of crop per acre in 1903 was about Rs. 120 as against Rs. 38–4–0, in 1881. Hence, rice had trebled in value since 1881, so that the assessment of 2·5 per cent. on the capital value as fixed in that year was, in 1903, far below that proportion as regards the wet lands. On dry lands, the advance has been similar but somewhat less marked; taking the staples of barley, beans, and tea, the first advanced from Rs. 3–8–0 per koku in 1887 to Rs. 10–8–0 in 1904 (in 1902 it was only Rs 6–6–0), the second went from Rs. 6 to Rs. 15 (only Rs. 12 in 1903), while the third only advanced from Rs 45 (per 132 lb.) to Rs. 60 or Rs. 65; hence the advance on dry lands has been well over double. Against this advance must be set the corresponding advance in the price of labour and manure; between 1887 and 1901 male day farm-labour advanced from 100 (index figure) to 232 and female from 100 to 250, and farm-labourers paid by the year from 100 in 1894 to 165 in 1901.* Manure advanced as regards human excreta (X) to about double its former cost, while fish manure (sardine) has risen from 100 to 229. Hence all farmers who have to employ labour and buy manure have seen their cultivation expenses rise in proportion; *per contra*, the vast number (55 per cent. of the whole) who, cultivating less than 2 acres, use little if any labour outside of their own family, have been but slightly affected by the rise in labour and manure, and have reaped most of the benefit of the rise of prices in so far as they were proprietors and not tenants; unfortunately, as shown above, the larger part of such cultivators are tenants of small holders and

* For prices of produce, labour, and manure see *infra* paragraph 42.

probably, therefore, pay competition or rackrents which have increased with prices. Still, the rise in prices accounts for the ease with which the greatly enhanced rates of assessment levied for the late war, were paid.

23. The cultivation expenses allowed are very similar in amount, both for wet and dry lands, to the State tax, an interesting fact in view of Madras controversies and of the intensiveness, thoroughness, and laboriousness of Japanese cultivation, which, while almost entirely human, is approached only by the best Madras wet and garden cultivation.

24. Net profit, it will be seen, is calculated at less than the combined amount of State and Local taxation, and of course diminishes precisely as the rate of taxation increases. Local taxation, however, was never charged at the rate given in the table; rates and amounts are given below.

25. *Amount of assessment and of local rates.*—The resulting land assessment in 1881 was 43 million yen, on not much above 11 million acres *plus* private forest areas; in 1898–99, it stood at the rate of 38·5 million on 12·34 million acres, since reductions had been effected in the original assessment; in 1902–03, owing to temporary enhancement, it was 46·5 million or 3·75 yen (Rs. 5–12) per acre on 12·46 million acres; in 1904–05 it was estimated at 60·9 million on 12·77 million acres owing to the special enhancement for the war, while the budget for 1905–06 was no less than 96·6 million by reason of the revised special enhancement Apparently the *normal* rate would be something over 3 yen (Rs. 4–12) per acre of wet and dry together, since the normal assessment in 1898 was 38·5 million on about 12·34 million acres. But it is very unlikely that the assessment will again fall to that level.

26. *Local rates.*—The State assessment, however, is but part of the land burden, for in Japan, the Prefecture, of which there are 46, is the unit of administration, levies its own taxes and expends its own income. The original law apparently fixed the maximum local (Prefectural) rate on land at 2·5 per cent. of its capital value similar to the State assessment, but this was reduced, and by present regulations the Prefectural land rate cannot exceed 1/3, and the town or village land rate 1/7 of the State assessment "*unless* with the approval of the Minister of Home Affairs." This approval seems to have been very freely given, for the Prefectural or district land rate rose by steady increases from 8·4 million yen in 1892, to 23·6 million in 1902–03, or 61 per cent. on the State assessment instead of 33 per cent., and the town and village land rate (exclusive of municipal or city

rates) from 5·9 to 14·75 million in the same period, or 38 per cent. instead of 14 per cent Hence the local land rates in 1902–03 amounted to 38·3 million yen when the State land assessment was 46·5 million (temporarily raised for the quinquennium 1899 to 1903 from 38·4), so that as stated in the 5th Financial Annual, 1905, as regards taxes in general, "the local taxes were almost equal in amount to the national imposts"; in 1902–03 the total local rates of all kinds including 11 millions in cities, were 105 million yen, against 151 million yen of national taxes pure and simple. It will be noticed that the mere *local* land rates are 3 yen (Rs. 4–9–6) per acre on 12·7 million acres of arable land. Hence the State and local land rates together average in normal years (*i.e.*, years without war or other enhancements) 6 yen (Rs. 9–3–0) per acre, wet and dry together,* but it is wholly unlikely that the State assessment will ever fully return from its present enhanced rates to the old or normal rate, since prices are now habitually high and the exigencies of State enormous, while the legal 2·5 per cent. has by the rise in prices fallen to a much lower percentage. It must further be remembered that these figures only represent the State (Imperial and Local) taxes, but that the full land burden on the Japanese peasant is, as regards two-thirds of them, measured *not* by the taxes but by the rentals which are far heavier; out of about 4·4 million cultivators (in only 38 districts out of 46) only one-third held as proprietors and paid ordinary taxes; two-thirds cultivated wholly or partly the land of the tax-paying holders. Hence Japanese agriculture is weighted not merely by the assessment and local rates but by the rentals paid to the tax-paying holders, and there does not seem to be any State regulation of such rentals, which are obviously rackrents as is usual, if not invariable, when the tenants of peasant land-holders are concerned.

27. *Other fiscal burdens.*—This is not a sketch of Japanese taxation, but it is impossible in considering agricultural burdens to avoid mention of *other* taxes which the peasant has necessarily to bear. Practically every adult Japanese, male and female, smokes; hence the *tobacco monopoly* producing a State income of Rs. 48,000,000, costs the agriculturists Rs. 5–8 for his family of 5·5 persons; under the *Salt monopoly* law he pays for his salt a tax higher than the present (1907) rate in India, viz., Rs. 1–14 per 112 lb. or about 8 annas per head according to the budget

* I have not been able satisfactorily to apportion the gross assessments to wet and dry lands respectively, but from the table in paragraph 20 *supra*, wet or rice land rates appear to be about 2½ times as heavy as dry (upland) rates.

for 1905–06; the *tax on liquor* (saki), which all drink who can, and of which the consumption per head of population apparently exceeds three gallons, is about Rs. 94,000,000 or Rs. 2 per head exclusive of the special war tax; the town, village, and prefectural *house tax*, exclusive of that in municipal cities, amounted in 1903 to Rs. 578 lakhs or above Rs. 9 for each of something over 6 million rural households.* Hence, irrespective of other taxation, these direct burdens on the agriculturist, outside of his land tax or rental, are very heavy, and though tobacco and liquor are voluntary, they have become almost necessaries, partly owing to climate, partly to the wet and toilsome character of much of the field work, especially on the rice lands in which every item of labour is in general done by the cultivator, male or female, deep in mud or water. This weight of taxation is only rendered possible (1) by a large yield per acre coupled with good prices, (2) by the most frugal living; and one object of stating the taxation is to show thereby how comparatively large and regular the yield must be; considering this yield with the general absence of imported manure to any great extent, we are forced to the conclusion that the Japanese methods deserve or rather demand careful consideration and especially their methods of restoring to the soil as much as possible of what they take from it, and of supplying the unavoidable wastage or defective restoration by the utilization of extraneous materials such as fish fertilisers, and the produce of their woodlands, of which a vast area forms part of the farmers' holdings.

28. *The land-tax law.*—The land-tax law divides "private" land into two categories, (1) arable, including building sites in villages, towns and cities, (2) ponds, marshes, forests, pastures, and miscellaneous uncultivated lands. The whole of this is "taxable land" except that since the word "private" includes communal etc. lands, certain quasi-public areas are exempted. The settlement classification is unalterable during the period of settlement except upon an ascertained change in classification, which owners are bound to report upon penalty of heavy fines; one quasi-penal provision is that it arable land is converted into forest or low class land of the second category the asssessed value is left unchanged for 5 years and is only altered in the sixth year. Land

* Japan has for civic administrative purposes 60 "shi" or municipal cities, and 638 "gun" or "*rural districts*" (counties or taluks) containing 1,121 towns (many of which are merely Unions of villages) and 12,388 villages; in 1903 above 36 millions lived in towns and villages not exceeding 5,000 in population, and apparently seven-ninths of these lived in villages below 2,000 in population. Hence the above 578 lakhs of house tax was paid by *rural* folk.

exempted from tax (usually wild or waste land) can only be converted into taxable land upon permission of the local authorities. and taxable land of the second category—also more or less wild—can be converted into arable land only after similar report, obviously in order to prevent "concealed cultivation," to use an old Madras phrase. The assessment on these lands of the second category is very low, apparently about 6 pies (one half-penny) or less per acre. Such conversions cost labour and money, and the law therefore contains beneficial provisions; for land newly brought in from "waste" (which by the definitions means "damaged" lands) or reclaimed from prairie etc., usually by cutting, levelling or ameliorating, the taxable value remains at the original or prairie valuation for 10 years, and is only then reassessed; if, however, the reclamation work cannot be completed within 10 years the authorities may extend the period of low valuation or exemption to 30 years, and if the reclamation is from waste water, exemption may extend to 50 years. Where labour and money such as would be expended in changing a field from the 2nd to the 1st category are expended in improving the physical configuration of an arable field, or in changing its classification, *e.g.*, from dry to wet land, the taxable value remains at the original rate for a period not exceeding 50 years, and is then re-assessed. On the other hand the Japanese do not scruple after such period of exemption to tax the outlay of private capital, since the field is then assessed on its actual improved value which has resulted from the owner's expenditure; whereas in Madras the greatest of improvements, viz., the conversion of dry land into "garden" by the digging of a well is free for ever from any such taxation of capital, and when dry is converted into wet no charge is made except for the water if supplied at Government cost

29. The Japanese law penalises acts and omissions, for which Madras law and orders now provide no penalty; *e.g.*, a heavy fine *plus* the full assessment, for concealment of cultivation or of cultivated lands, and similar fines for changing the classification of land or converting it from waste, etc., without previous report or permission, but the fines may be remitted if the offenders voluntarily confess their offences.

Area Cropped and Outturn.

30. The following table gives a conspectus of the crops raised in Japan in 1902, for which alone full particulars are available, but which was considerably below a normal year in productiveness:—

Crop.	Gross area under cultivation (acres.)	Area of crop. (Thousands of acres.)	Gross outturn. (Thousand of bushels etc.)	Gross value. (Thousands of rupees.)	Average outturn per acre. (Bushels, etc.)	Average value of crop per acre.	Average value per bushel	Remarks.
1	2	3	4	5	6	7	8	9
						Rs. A. P.	Rs. A. P.	
Rice	(Nanjei) wet lands 6,812,158	6,769·5	181,928	6,68,160	(b) 26·9	(c)98 10 0	3 11 0	(a) Rice was grown on 205,200 acres of upland as a dry crop yielding much less per acre than on wet land.
Rice (a)	(Punjei) Uplands 5,651,170	205·2	3,033		14·8			(b) The *normal* outturn of husked rice as based on seven ordinary years exclusive of two abnormal ones, is just 1·52 koku per tan or 30·75 bushels per acre.
Wheat		1,166·2	19,535		16·75			
Barley		1,580·2	40,730	1,86,096	25·76	42 0 0	2 0 0	
Rye		1.670·9	31,860		19·06			
Beans		1,457 7	19,220	53,928	13·2	37 0 0	2 13 0	(c) The price of rice was lower in 1902 than in 1904, by about Rs. 9 per 30 bushels; this and the short outturn—short by about one-tenth—account for the short acreage value of Rs. 98–10–0, against a normal value in 1904 of nearly Rs. 120.
Millets		1,2·2·7	19,020	...	15·68	...	...	
Sweet potatoes		676·2	2,622,800 tons.	...	3·9 tons.	...	...	
Potatoes		103·9	198,260 tons.	...	1·9 tons.	...	...	
Cotton		50·7	12,231	...	240 lbs.	...	...	

Hemp	(Punjei) Uplands 5,651,170	41·4	.....	...	...	...	..
Indigo		91·1	.. ...	...	...	...	...
Tobacco		58·7	66,884.843 lbs	..	1,140 lbs.	...	..
Rape		382·7	5,552,230 bushels.	...	14 5 bushels.	...	...
Sugar		60·6	494,551 tons.	...	8·16 tons.	...	...
Silk Mulberry		777·0	12,746,120 bushels of cocoons.	...	16·4 bushels.	...	...
Tea		120	55,960,806 lbs.	28 820	466 lbs.	240 0 0	..
Total ...	12,463,328	16,424,584	.....	..	...	...	...

NOTE.—"Rice" is husked rice (geumai', not paddy; the outturn (26·9) bushels per acre is therefore equal to nearly 54 bushels per acre. Sugar shows the very large outturn of 8·16 tons per acre; this is possible as the cultivation is on a comparatively small scale and excellent; the outturn may be compared with the Java produce and with the best crops at Poona which were, it is believed, partly manured with poudrette.

31. *Second crop.*—The area in Column 3 gives the area of crops raised on the area of soil in Column 2, and shows an excess of 3,961,262 acres, or 31·8 per cent., which of course is second crop. This, however, by no means gives the true area or proportion of second crop to ordinary arable land; first, the area under mulberry and tea (857,000 acres) which is necessarily single crop land, must be deducted, leaving 11·56 million acres for annual crops, so that the percentage would be 34·25; secondly, a large but unknown area of the paddy land grows a green crop of astragalus, which finds no place in the table; thirdly, the enormous quantity of vegetables, radishes, pumpkins, etc, so largely eaten by the Japanese and usually planted as second crops interstitially, are not included; hence the real area of crop is not shown in the table, and the true percentage of second crop is much larger. Since practically no second crop of rice is grown—as shown not only by season, but by the fact that the rice crop in 1902, excluding 84,193 cho of dry land rice, was 2,767,503 cho of rice crop grown on 2,780,457 cho of wet land—it follows that all second crop is "dry" crop grown to a moderate extent as a winter crop on wet lands (see "agricultural methods") but, more generally, as a regular second crop on dry lands which in the south are credited with two crops per acre regularly; this is obvious to a visitor in spring who sees vast areas under cereals and beans harvested in May, and at once placed under further crops. Since the rigorous climate of the northern parts probably excludes much second crop it seems that the bulk of such crop is in the southern provinces of the empire.

32. *Outturn per crop-acre.*—This second crop growth must be remembered in considering the outturn per acre of crop, which otherwise appears low except as regards rice. For instance, 16·75 bushels of wheat per acre seems poor compared with British yields, though not so much so when compared with the yields of many great countries, but in reality it is largely grown as a mixed crop with rows of beans, etc., alongside, while it is followed by a second crop of any nature; it may be seen also with rows of beans on the high ridges formed for winter crops in the paddy fields. Hence in Japanese outturns it is not so much the yield per acre of crop as the yield per acre of land which must be considered, and this is complicated by the frequency of second and mixed crops.

33. Taking rice lands ("wet") first; the "normal" area and produce are 6,774,436 acres and 208,255,000 bushels, respectively; hence the average per acre of husked rice (genmai) is 30·75 bushels weighing nearly 2,000 lb., or above 61 bushels of paddy weighing

some 2,750 lb.* This is heavy cropping in itself seeing that it is the average in an ordinary year of all fields of all qualities and in all climatic positions. But in addition to the rice crop there is a winter crop; the average area is not known, but in 1904 35,216,000 bushels of wheat, barley, and rye were grown on 1,640,275 acres of rice (wet) land, and 6,235,000 bushels of rape on 195,000 acres. Hence, while 6,783,000 acres grew 30·7 bushels of husked rice, 1,835,000 acres of the *same* area also grew 22·6 bushels of wheat, etc., or an aggregate of 53·34 bushels per acre on that area or, calculating rice as paddy, about 83 bushels. Besides these crops astragalus was grown on an unknown but considerable area; this, however, is a restorative and not an exhausting crop. The production of rice in 1904 on an area about 1·5 per cent. above the normal was just 22 per cent. higher in outturn than the normal; that of 1902 was on exactly the normal area but about 14·6 per cent. lower. Hence the normal figures may be safely taken.

34. Turning to the uplands; in 1904 5,828,700 acres were cultivated. All *edible* crops in that year aggregated 14,848,500 acres, of which 8,495,000 were grown on rice land; hence the remaining 6,353,000 were grown on the uplands. But of the 5,828,700 upland acres 1,295,000 were devoted to non-edible

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* The "normal" produce is that officially calculated as the average produce of a series of years excluding years abnormally good or bad; it is regularly entered at the foot of a comparative series of years in the annual Statistical Reports of the Agricultural Department. In considering the value of Japanese agricultural statistics, it must be remembered that they are no novelty in Japan; they have been recorded in one shape or other for centuries and have been systematized for many years; the Japanese thoroughly understand the objects and use of statistics, and the vast number of trained agricultural officials and observers scattered over the country in 46 main Experimental Stations and many smaller ones in above 12,000 Agricultural Associations of all grades, societies, etc., coupled with the nexus of administrative organisations from the village to the prefecture, provide special facilities for the collection of accurate figures in these and many other subjects; Japan has the facilities of the Madras system *plus* the assistance of all the numerous official, *quasi*-official, and private institutions mentioned.

The outturns given are confirmed by numerous calculations and statistics scattered over various writings; *e.g.*, in the official catalogue for the Philadelphia Exhibition (1876), the very best land is stated as producing 42 bushels, the worst 21, and ordinarily good land 35 of husked rice in a good year. If my informant correctly gave the rental paid by a country agricultural school for its farm land (see footnote to paragraph 143), the yield on some very fertile land in Aichi prefecture amounted to over 50 bushels or nearly 1½ tons of husked rice per acre, an immense yield. Dr. Ono states that "the yield of 50 or 60 bushels to an acre is not unknown in some parts of the country"; elsewhere he says that "in some provinces the *average* yield of an acre reaches as high as 41 bushels of rice." In the 16th century wet land of the first quality was said to produce 1·5 to 2 koku per tan (quarter acre) or from 30 to 40 bushels per acre (Simmons and Wigmore in "Asiatic Transactions"). Hence the "normal" produce may be taken as correct for normal years.

crops such as silk mulberry, hemp, indigo, tea, etc.; hence the 6,353,000 acres of edible upland crop were grown on 4,533,700 acres of land, so that each land acre grew 1·40 acres of crop. For cereals the average outturn per crop-acre is recorded as 21·8 bushels, or 1,177 lb. at 54 lb. per bushel, so that the outturn per land acre was equal to 30·5 bushels or 1,647 lb. For wheat, barley, and rye 1904 was practically normal, viz., 1·091 koku as against a normal of 1·076 per tan or 21·8 bushels per acre against 21·5. The yield of sweet potatoes was 8 per cent. less than in 1902 or 3·6 tons per acre, but that of potatoes was 35 per cent. larger, or 2·5 tons.

35. The above upland yield is good, but does not nearly represent the outturn; vast quantities of vegetables, cabbages, radishes,* onions, brinjals, gourds and melons of various kinds, and very many others are raised everywhere; a large number of shrubs and small trees such as vegetable wax, the lacquer tree, etc., and a certain quantity of fruit are also grown, and there are large areas of flower gardens. These do not appear in the statistics. so that the above figures are minima; officially it is stated that "in general two crops are raised in one (upland) field, and occasionally even more."

36. The normal gross outturn per annum for the past decade is something as follows; the acreage of *food* crops was 14,803,000, of which 12,627,000 acres of cereals (rice, wheat, barley, rye, millets) yielded 8,283,000 tons, at an average of 40 bushels per ton, 1,409,000 acres of beans yielded 608,000 tons at 31 bushels per ton, and 767,000 acres of sweet and ordinary potatoes produced 2,824,000 tons; total food produce about 11,715,000 tons. There would be also about 1,300,000 acres of non-edible crops including tea, as specified in the table, and an unknown but very large quantity of vegetables and some fruit. This gives about a quarter of a ton of edible land produce per head of the population; some, however, is used for distilling liquor and in the arts.

37. *Value of crops.*—The value of all crops in 1902, viz., cereals and all other food crops, silk, tea, and straw, to the extent of 16,424,584 crop acres, is given as 960 million yen, or

* The radish (Raphanus sativus, daikon) of different (14) varieties, bulks very largely in Japanese diet and in one form or other is found at every meal at all events among the rural classes. These radishes, grown over a wide area, are often of huge size; that known as Sakurajima-daikon growing to 3 feet in circumference and weighing 20–30 lb. Apparently there are three crops of this root, early, middle, and late; they are, as usual, sown in rows, the soil well hoed and the plant manured at frequent intervals; it seems to be a two or three months crop.

Rs. 144 crores; in this are included 17 crores for silk and tea, and 13 crores for straw, ordinary crops thus being valued at 114 crores. Hence, deducting 897,000 acres of silk-mulberry, and tea, the remaining 15·52 million crop-acres produced crops worth 1,140 million rupees or Rs. 73·5 or with straw Rs. 82 per crop acre. The agricultural produce for the whole country including, besides the above items, dairy produce (Rs. 62 lakhs), poultry and eggs (Rs. 259 lakhs), stable manure (Rs. 355 lakhs) butchers' meat (Rs. 262 lakhs), was valued at Rs. 153·5 crores, practically the whole of which was produced on an average of 12·46 million acres of land or Rs. 123 per acre. The value of straw, poultry and eggs, stable manure, and butchers' meat is noteworthy, as it is not only considerable, though the country has so few cattle and horses, and is almost devoid of sheep and goats, but suggests values which are often omitted in considering Madras outturns.

38. *Value of stable manure.*—The value put on stable manure of Rs. 355 lakhs is startling especially considering the notorious paucity of cattle in the country. At the end of 1903 (figures for 1902 are wanting) there were only 3,021,681 cattle and horses of all ages besides just 275,000 (!) pigs, sheep and goats: hence the average value of manure per head is entered at nearly Rs. 12. This though very high is not impossible (1) because the cattle are usually large, (2) because they are mostly well fed, (3) because *more Japanico*, every care is taken to secure every atom of manure (see below *s.v.* "manures"); in England 18 shillings per annum is said to be the value of a beast for manure. It is curious to think of a country of few cattle valuing its stable manure at such an amount when its value in this country is usually neglected in considering farm outturns; for instance, in the Madras Presidency for the *ryotwari area* alone and exclusive of Malabar and South Canara, the number of horned cattle in 1900 was not less than 13·5 million and that of sheep and goats 14 million, and there was also a very large number of horses and ponies besides a vast number of pigs and fowls. The Japanese valuation of stable manure alone, is not far short of the whole ryotwari land revenue proper on 20 millions of acres (exclusive of Malabar and South Canara) a very few years ago.

39. *The gross normal value of agricultural products.*—It will be remembered that in 1902 rice was short by one-tenth of a normal crop; even in that year rice was valued at Rs. 66 crores, so that the shortage amounted to 6·6 crores. Rice has since risen in price by about 10 per cent. and several other staples similarly, so that the present normal aggregate value of Japanese

agricultural products cannot be much short of Rs. 170 crores on 12·8 million land-acres or Rs. 132 per acre.

40. Wet land per acre appears to produce edible crops more largely than the uplands in the proportion of 5 to 3 as regards quantity, but in the proportion of nearly 7 to 3 as regards aggregate value owing to the high price of rice. Taking all crops together and including straw, poultry and eggs, but excluding cattle and manure values, we find about 8·6 million crop-acres on wet land producing in 1904 crops of rice, barley, etc., worth about Rs. 99 crores, and 7·8 million crop-acres on dry land producing about 63 crores, or Rs. 115 and Rs. 80 respectively; the value of the upland crop-acre is somewhat increased by the value of silk and tea per acre. Taking the actual land acreage under cultivation in 1904 as 6·9 million acres of wet land and 5·83 acres of dry, the outturn per acre would be Rs. 145-3-0 and Rs. 108 respectively or in the ratio of 12 to 9. It will be noticed that the disparity between the productiveness of wet land and dry land is not nearly so great in Japan as in Madras, owing partly to climate but mainly to the cultivation system.

41. The figures given demonstrate better than mere description the character of Japanese agriculture, the success with which a country isolated for centuries from all others without imported manure until quite recently, wholly dependent therefore on her internal resources, devoid of mineral and "artificial" manures, possessing few cattle and practically no sheep and therefore comparatively little farmyard manure, has yet been able not only to maintain a sturdy population upon a minimum area per head, but has raised lands not originally fertile to a great degree of continuous fertility as manifested by the annual produce. *Tillage and manure, strenuous spade labour, and the utilization of all waste* are the main secrets of Japanese husbandry.

42. *Prices.*—For the sake of convenience the prices of a few staples including labour and manure, are put together in tabular form as follows :—

Item.	Measure, Weight, etc.	Price.			Remarks.
		1887.	1896.	1904.	
		Rs. A.	Rs. A.	Rs. A. P.	
Rice (husked) ..	Koku = 5 bushels.	7 0	13 12	19 8 0	
Wheat	Do.	...	...	14 2 0	
Barley	Do.	3 8	5 6	10 8 0	

Item.	Measure, weight, etc.	Price.			Remarks.
		1887.	1896.	1904.	
		RS. A.	RS. A.	RS. A. P.	
Beans	...	6 0	9 10	15 6 0	
Sugar (Jap. white).	100 kin = lb. 132.	13 2	16 12	19 8 0 to 24 0 0	
Tobacco (leaf)...	Do.	12 12	19 6	(a) 90 6 0	(a) Rise in price due to the State monopoly.
Tea	Do.	39 0	50 0	57 12 0 to 68 8 0	
Salt	Koku ...	1 12	3 10	(b) 3 0 0	(b) The salt excise duty had not come into operation. This is nearly equal to the late Indian duty of Rs. 1-8-0 per 82 lb.
Fish manures (sardines).	10 kwam = 82⅔ lb. 1 Indian maund	2 6	4 3	5 13 0	
Fish (herrings).	Do.	...	4 8	6 2 0	
Rape cake ...	Do.	...	2 10	3 2 0	
Agricultural daily labourer—					
Male ...	...	...	0 6-3	0 7 9	
Female ...	...	...	(c) 0 4	(c) 0 4 9	(c) These figures are for 1897 and 1903 respectively.
Agricultural annual labourer—					
Male ...	...	...	43 12	57 0 0	
Female ...	...	...	(c) 23 10	(c) 30 0 0	

43. *Value of land.*—Statistics have not been obtained on this point, but will be supplied in a revised issue. In 1881 the average value was mentioned by Rein as Rs. 325 and Rs. 125 per acre for rice and dry lands respectively, and somewhat higher figures by another authority in 1882, but the statistical report in 1888 quoted by Dr. Ono gives only Rs. 270 and Rs. 84 respectively. Owing to the trebling of prices since 1887 it is certain that the present price of land taken as 25 times the net profit must be greatly in advance of all previous prices, notwithstanding large advances in the price of manure and purchased labour.

GENERAL CHARACTERISTICS OF AGRICULTURE.

44. "Japanese farming," says Rein, "is very much more careful (than the Chinese)* and more to be compared with the scientific horticulture and market gardening in the neighbourhood of our large (German) cities. Japan possesses all the requisites for carrying out such methods, viz., division among many small owners, plentiful watering through rainfall and canals, and, above all, immense supplies of cheap and willing labour to which also women and children contribute." He adds remarks as to the excellence of the tillage, to the careful utilization of all available manures, to the economical and rational application of such manures, to the careful watering bestowed, and to the industry shown in keeping the fields clean.

The above remarks admirably give, in brief, the characteristics of Japanese farming, but require to be accentuated and supplemented.

Utilization of Space.

45. Japanese field cultivation (I write of the southern provinces) is very remarkable; it utilizes every accessible square foot of soil and tills that soil with the greatest thoroughness. The low hills are terraced to the very top, patches of cultivation appearing in almost inaccessible spots; this is specially visible when the ripening corn shows out yellow against the scrub or woods of the hills; the houses take up a minimum of space and the backyards are cultivated up to the doors of the cottages; not a waste corner is to be seen, nor is any space taken up by hedges and walls, partly because land is too valuable, partly because there are no cattle, sheep, or goats to trespass; cultivable waste land is not to be seen and bare fallows are unknown. This utilization of space is a primary characteristic of Japanese farming.

Tillage.

46. The second characteristic is the thorough tillage of every foot of ground under cultivation; there is *no* slovenly cultivation,

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* This is doubtful; other observers give the palm to Chinese agriculture for carefulness, absolute utilization of waste, ingenuity, &c. Probably each observer is thinking of the best in the country which he prefers; the cultivation of Japan in the south is wonderful and of the character which Rein gives to it; in provinces round Pekin and elsewhere Chinese agriculture seems to be similar. I have been informed by His Excellency Baron Mumm, late German Ambassador to China, that nothing can surpass Chinese agriculture in the minute and careful character of the cultivation which he saw in various tours especially in the province of Chi-li (near Pekin); not a scrap of ground or of material was wasted, and the crops were splendid. Probably Chinese and Japanese agriculture are similar when conditions are similar; it is the utilization of possibilities—land, time, labour, material—which is a most noticeable feature in both; certainly it is so in the only part which I have seen, viz., the neighbourhood of Shanghai.

no carelessly worked areas; all seems on a general level of excellence and is like one vast, well worked garden.* The soil, generally of dark loam, is absolutely clean; weeds are not to be seen at any time amongst the crops; all stones are removed so that every square inch may play its part. It is, however, the deep and constant tillage which so forcibly strikes a Madras observer, since its methods contrast so strongly with the perfunctory scratching of the ordinary field cultivation of the Presidency; the only parallels are the cultivation of "gardens" (dry land irrigated by wells) especially in Coimbatore and Salem, and the preparation of the soil for special, *e.g.*, sugar and tobacco, crops; the difference is that in Japan *all* land is treated like that of "gardens"; agriculture in Japan is horticulture. In the first place it is dug over by hand with the long hoe or fork; this penetrates, especially in the well-worked soils of Japan, deep into the soil which is turned completely over and worked into a fine tilth; this again is, for upland crops, worked into ridge and furrow, and again levelled after the crop is over. Moreover while one crop is occupying the ridges the furrows are dug over for interstitial cultivation so that the soil is cultivated many inches below even the bottom of the furrows; and when the ridged crop is reaped the interstitial crop is gradually earthed up so that the furrow becomes in turn a ridge and the ridge a furrow, and so *ad infinitum*. The result is a complete aëration and pulverization of the whole soil to a very considerable depth, producing a perfect tilth and a deep seed bed into which a stick may be readily pushed many inches below the bottom of a deep furrow, and of which every cubic inch is in a healthy and uniform state and ready for the storage of food and moisture, and for the due yielding up of its stores to the rootlets which readily penetrate it. This is specially noticeable in the uplands; these in autumn are well and deeply worked and then ridged about a cubit to two feet apart; winter wheat, barley, etc., are planted on the ridges which are carefully maintained; in April, etc., other crops are planted in the furrows, and after the wheat and barley are reaped these in turn are ridged up. In the case of wet lands the noticeable point is that the moist stubbly soil is, in April and May, inverted in deep blocks by the long hoe or fork so that the surface soil which grows the crops is of considerable depth. In the case of those wet fields which, in winter, are used for dry crops (about 27 per cent. are so used), the surface soil is drawn into high ridges, some 4 or 5 feet apart, on which several contiguous rows

* In visiting Japan one is perpetually reminded of the old Roman agricultural maxim "Fecundior est culta exiguitas quam magnitudo neglecta"; better the well-worked plot than the ill-worked field.

of wheat, barley, beans, etc., are grown; this ensures not only a thorough turn over and tillage of the surface and a deep seed bed for the winter crops, but permits the adjacent sub-soil, uncovered by the ridging of the surface soil, to be weathered and aërated; the ridges are of course levelled in May when the rice crop is to be planted so that the crop roots have a deep bed into which they readily penetrate.

47. *Ridge and furrow system.*—The ridge and furrow method is the prominent characteristic of Japanese upland (punjei) cultivation. After the ground has been thoroughly cleaned and worked up after a crop into a fine seed bed, the seed is sown in carefully traced rows 20 to 24 inches apart; cereals are simply dropped by hand in a shallow furrow, but beans and peas are dibbled in. Broad-casting is *never* practised except in seed beds for subsequent transplantation; it would be impossible under the Japanese methods of incessant interstitial tillage and constant manuring which may be effected 5 or 6 times during a crop. As the plants grow they are gradually earthed up, in some place by a horse-hoe, but usually by hand hoeing; in this way is formed the characteristic ridge and furrow of a Japanese dry field. As stated above, when the crops on the ridges are ripening interstitial crops are grown on the furrows, and on the maturing of the first crop the ridges are broken up, cleaned, and the earth gradually ridged up against what were the interstitial plants. Hence a Japanese upland field is utterly unlike even a Deccan dry field; the latter indeed is drilled but drilled closely and interstitial cultivation is superficial and entirely on the flat. Still less is it like the ordinary dry field of the Tamil districts where cereals are sown broadcast and the only attempt at getting the plants into line or weeding is an early ploughing through the young plants with the result that weeding, after the above solitary ploughing, cannot be effected, and crop and weeds grow together until the harvest.*

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* The rains had been good in Tinnevelly and Madura as I returned from Japan, and the difference between a field of cholam or cumbu and the crops I had seen in Japan was most striking; weedy fields in which it was difficult to say whether they were growing a crop of grass, etc., or a cereal; the stalks in a confused mass here dense there scanty, here tall there thin and stunted; half the crop in a field ripe and the other half in various stages owing to the choking and suffocating of many plants by their too numerous neighbours, or by weeds, or by want of ventilation and sunlight. No one who has spent many years wandering through Madras crops at all seasons can fail to be struck by the irregularity of the dry land crops; from 2 or 3 to 6 feet high in the same field; some ripe in one month some in another also in the same field; some plants and ears starved some full. Agricultural proverbs in Tamil are often excellent, agricultural practice is often the reverse, and in most cases it is the fault of defective system and deficient tillage-labour as well as of deficient manure.

48. It is claimed for the method that it permits or rather compels deep cultivation with complete aëration and commingling of the soil; that it is economical of seed; only so much seed is sown as is absolutely necessary; it allows free tillering and full development of the plant owing to free ventilation and sunlight and to the supply of fresh earth not only in the deep seed bed but by the frequent earthings up; it permits the planting of one crop while another is growing; but its chief merits seem to be that it permits easy and thorough tillage during crop, the absolute removal of all weeds, the formation by tillage of that mulch of fine earth so essential to maintain moisture in the under soil, the easy watching of every plant in the crop, and the ready application of small doses of liquid manure (X)* whenever necessary. The amount of tillage given during crop growth on the uplands is almost incredible; whatever the crop may be it is thoroughly hoed for the removal of weeds and pulverising of the soil from 3 to 7 times for each crop, according to necessity and the nature of the crop, the last working (and manuring) being given at the time of putting forth ears, pods, etc.

49. *A specimen year.*—The following account of a year's cropping of an upland field is given by Dr. Shinkizi Nagai:—

"For example; in my birth-place (in Shikoku) a field which has just borne a summer crop is at once worked up for a new winter one which is then sown in the usual way. In spring after the tillage work on that crop is over, the interstitial furrows are planted up with indigo which has been prepared in a seed bed. Shortly afterwards the winter crop is harvested, and the soil is then worked over and manured to strengthen the young indigo; as these plants grow up the earth is gradually drawn up to them so that what was once a furrow becomes a ridge. The indigo is cut for the first time in July, the roots being left to grow a second cutting; when this second cutting is at the flowering stage, soja beans are sown in the furrows. Soon after the beans are above ground the indigo is ripe for the second harvest and is then pulled up by the roots. The farmer then turns all his attention to his beans which are harvested in October, and the field is then deeply worked all over and sown for the winter crop."

50. This is in the south of Japan and such incessant cropping would not be possible in a Madras climate; it is only possible in Japan in consequence of the incessant, untiring labour bestowed by the Japanese farmer, and of his manuring methods. A similar account in a different locality and with different crops is given by Dr. Maron, and the method is of course visible to any one with

* X is the symbol used throughout this Note for mixed human excreta, always used as liquid or semi-liquid manure; see "manures" *infra*.

eyes who will spend even a few weeks in the country. The point is not the succession of crops for that is only rendered possible, perhaps, by climate, but the system and character of the tillage; it is certain that tillage such as the Japanese farmer gives would make a very different thing of Madras harvests, still more if the manure (X) which he uses were not neglected, and it is by no means certain that Madras soil if deep-tilled and manured as in Japan and Flanders might not, in the nine months between the beginning of June and the end of February, produce two good crops regularly if the depth, texture, and tillage of the soil were considered rather than superficial area, and if manure were utilized as it should and might be; very little rain is needed in a well worked soil of proper texture, depth, and condition.

51. Stones, thorns, and weeds are as unknown on the uplands as on paddy fields; I have seen uplands under reclamation from hill sides in which the whole family has laboured for days removing every stone that could be found and utilizing them for a neat revetment against wash and erosion. Rains in Japan are often heavy, and wash is prevented partly by the depth of the tilled soil which absorbs a large quantity of the rainfall (yet, through its healthy porosity, permits of natural through drainage) partly by the ridge and furrow system, partly by the care taken in keeping the fields, even the uplands, fairly level by cutting and terracing.

52. So also the laborious improvement of soils by the addition of sand when clays are too stiff, but far more usually the addition of loam and vegetable mould to light and sandy soils, has been extensively practised from time immemorial; this is one of the methods by which soils are brought to that state of *healthy uniformity* which is so marked a characteristic.

53. *Labour.*—Under this second characteristic—thorough tillage—must be considered the nature and quality of the labour put into the soil. The first point is that it is spade or manual labour, and that except on moderate areas in particular tracts, cattle and horses are not employed; in the south and south-west there are some oxen and horses, and I have twice seen a horse at work either ploughing or levelling land, but the great mass of labour is *human* and the chief cultivating tools are the spade, hoe, and fork and not the plough.* This fact is due partly to the small

* One is forcibly reminded of Flemish spade husbandry with its splendid and deep tilth; the title of a Flemish work on husbandry is "The Spade, or the Gold Mine of Eastern Flanders," which is, in fact, a Flemish proverb, similar to that of Italy "The plough may be silver, but the spade is gold." In fact Japan is in the East what Flanders is in the West as described by De Laveleye, Cliffe Leslie, Radcliff (1819), Van Aelbroeck (1830), and other writers; minute

size of the farms, partly to the Buddhistic objection to taking animal life so that meat is not an article of diet, partly to the non-use by the Japanese of milk and milk products as food, butter being unknown and cheese an abhorrence. Practically there is little room for cattle; the average size of Japanese farms is just 1 cho or 2·45 acres (practically a hectare, 2·43 acres) which, even though tilled with Japanese thoroughness, cannot absorb much more than the labour of a family when, as in Japan, adult females work and all males of a working age.

54. *Minuteness of culture.*—Statistics show clearly the smallness of Japanese culture; the average is about 2½ acres, but no less than 55 per cent. of the agricultural families cultivate less than 2 acres, 30 per cent. above 2 but less than 3¼, and only 15 per cent. above 3¼; these may be compared with Madras figures of above 67 per cent. averaging about or somewhat less than 4 acres, 22 per cent. averaging about 10 acres, and nearly 10 per cent. above 10 acres.

In Japan there are about 5,070,000 farming families (or 60 per cent. of the population) averaging 5·75 per family with working members equal to at least 2·5 adults; hence there are about 12·67 million workers for 12⅝ million acres, or practically one per acre. For actual village work, therefore, cattle are unnecessary so long as manual labour is customary and available.

55. An estimate has been made ("Japan in the 20th century") of the number of days of labour required for each crop; to judge by other authorities the estimate, which is expressly stated to be rough, is decidedly a minimum.

Crop.	Per acre. Men + Women.		Crop.	Per acre. Men + Women.	
Rice	68	36	Rape	40	36
Barley	44	24	Beans	28	20
Wheat	44	24	Indigo	72	48
Rye	48	24	Tobacco ..	100	92
Buckwheat ..	32	12	Cotton	60	76

Hence if a family owning one cho (2½ acres) has a rice crop of 1½ acres followed by a barley crop on one-fourth of the same area, and the usual two crops on his upland of one acre, the labour days required of his family would be something as follows:

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holdings, strenuous and continuous labour, spade and hoe husbandry, deep tillage, the laborious collection and utilization of every scrap of material (street sweepings, house refuse, the contents of privies, farm manures, oilcake, etc., etc.) that can be used as manure, the planting of intermediate and catch crops; in other words, the complete utilization of space, time, material, and labour. As in Japan, so in Flanders, vast areas of what are now fertile fields were originally miserable wastes of lean soil; it is labour and manure which have changed them: in Madras the labour and the manure are as *possible* as in either country.

rice 102 men and 54 women, barley 18 men and 9 women, wheat on one acre 44 men and 24 women, other crops on one acre 32 men and 12 women; total 196 men and 99 women. In other words the minimum labour put into actual cultivation of the farm will occupy the owner for nearly seven months and his wife (or wife and boy) $3\frac{1}{2}$ months; besides this there is a vast deal of labour not capable of being put into figures, such as the gathering of leaves, seaweed, etc., and making composts for manure, the cutting and stacking of timber for fuel, the carriage of manure from the towns to the homestead, the threshing, preparation, and marketing of the goods, the reclamation and improvement of land by levelling, by the removal of stones, by the admixture of other soils, etc., the clearance of the irrigation channels and drains * and so forth, in addition to special and by-industries such as silk, straw plaiting, etc.†

56. Hence even in winter, though little actual cultivation work is then done, the Japanese agricultural family is kept busy, those holding less than one cho selling their labour to those who cultivate more than that area. The above figures show also that 1 cho is about or perhaps above the limit that a family can work thoroughly as a farm when unassisted by cattle; if worked as a market garden near a city it would be too much even for Japanese, since, to quote a concrete case, a ten-acre market garden in Massachusetts worked with American labour was said to occupy 20 men. The point of these statistics will be indicated *s.v.* "suggestions for Madras"; at present it suffices to show the intensity of the labour put into the soil in Japan.

57. Dr. Shinkizi Nagai writing in 1887, gives in one place 84 days as the average labour required for an acre of rice but

* In Japan irrigation works are looked after by the cultivators alone, either individually or as communal bodies; in some parts there are many irrigation tanks which are wholly kept in repair by the peasantry, and if one bursts they have to repair it at their own expense, usually obtaining however a small grant-in-aid from Prefectural (district) funds; all irrigation channels and drains are kept clear by them. Kudimarámat in fact is fully carried out in Japan even to the maintenance and restoration of tanks.

† The Japanese cultivator and family are busy in other ways than in mere cultivation; sericulture is a special industry carried on at intervals—there are two or three crops from spring to autumn—in the farmer's home, where the silk is still largely spun. Then, though there are no cattle to be tended or dairy to be run, there are various small home manufactures of prepared food stuffs, dried fruits, and vegetables, etc., the manufacture of many articles from the straw of the crops such as hats, coarse mats, straw rain-coats, etc., a certain amount of fishing by the men and weaving by the women, the cutting for sale of wood as timber and fuel, the gathering and treatment of seaweed for food or manure and so forth. There being no caste restrictions or hereditary disabilities, any man or woman can and does take up any subsidiary employment at pleasure when opportunity offers

elsewhere he states that up to 160 days' labour are required for an acre, while for an upland field a fourth more is required, since labour is more continuous. It has been estimated by one authority that one strong man is required for the whole work of 1¼ acres of rice or of from ⅝ to one acre of upland; and by another that an ordinary family can only manage two acres (8 tan) of rice land or 1½ acres of dry land without hiring additional labour. The cultivated acreage is about 12·8 millions and the agricultural population, taken at 60 per cent. comprises about 5·07 million households of 5·75 persons each, of whom 2·5 per household, or 12·7 millions in all, are probably workers; this gives about 1 acre per worker of all ages and both sexes. Taking the produce exclusive of manure, slaughter of live stock, and other minor items, at the value of Rs. 163 crores, agricultural labour produces in Japan about Rs. 125 per head, which is the equivalent of about 32 bushels of husked rice or of 50 bushels of barley. The number of labourers however taken as 12,070,000 includes women and boys; if the aggregate labour of these latter is equal to half that of the men, then the outturn per head reduced to terms of male adult labour would be about one-third greater or Rs. 167 per head or 43 bushels of rice or 67 of barley. This estimate, however, takes no count of the fact that many men are fishermen, etc., and that many women weave, or of the by-industries which occupy so much of the peasant's time in winter, or the produce in vegetables, fruit, flowers, wax and lacquer, and many other valuable products not entered in the tables of produce. Hence the actual outturn per head is a good deal larger than the bare value given above. Perhaps the best way of estimating is to say that since the number of agricultural families about equals the number of cho (2–45 acres) under cultivation, and as each cho produces on an average about Rs. 320, each family, taken as 2·5 working members, produces on an average that sum *plus* the produce of additional industries (fishing, etc.), of winter by-industries (straw-plaiting, etc.), and of non-registered vegetable products.

58. This, of course, when compared with *per capita* produce in the West is a moderate outturn for the amount of labour expended, and is due to the fact that most of the labour is human, beasts being few and machinery practically *nil*; it is calculated that if cattle were employed the labour per acre would be decreased by perhaps two-thirds. To put the case in other words; the *acreage* outturn in Japan is large owing to the labour, etc., expended; *per contra* the *per capita* labour outturn is small just because the labour is chiefly human.

59. Hence the example of Japan in doing everything so largely by manual labour is not necessarily one to be imitated in Madras.

where areas are wider, holdings larger, and cattle and sheep numerous; the *desiderata* are that thoroughness, depth, and frequency of tillage, that persistent, tireless labour, the year and the century round, that utilization of all sorts of manures and soil ameliorations which, taken together, make the Japanese hoe into a silver mine. In Madras the plough and the hoe together, the reorganized manure pit and the cattle stall, the green manures and the leguminous tree, should be the mainstays of cultivation; if Madras does not enjoy the rainfall and climate of Japan, she at least possesses abundance of cattle and sheep for labour and manure; she has the man-fold if she would use it for manure, but she has in addition the cattle pen and the sheep fold; if she has her disadvantages, she has also her advantages. These points will be more fully discussed *infra s.v.* "Suggestions for Madras."

Manuring Practice.

60. *General principles.*—But while, as in Roman Italy, tillage is the first and the second essential of the cultivation of the soil, so manuring is the third*; they dig it and dig it and dung it. In India we have been too apt to look on the soil itself as the chief source and feeder of crops, and we have consequently drawn on it as on a bank balance till it has been attenuated to exhaustion; nature teaches otherwise, *viz.*, that organic life, animal and vegetable, is a circulating system of rotation in which the crop and the consumer is alternately nourished, each by the other, through the medium of the soil, and the Japanese have learnt the lesson; *no* crop is planted without its dose of manure, no manure is wasted which ought to become crop. Crops are not grown upon an assumed capacity of the soil to yield up by its gradual decomposition a certain amount of plant food; a Japanese would consider that an error similar to that of living upon capital, nor does he ever plant a crop to utilise an unexhausted balance of manure from a previous crop; each crop receives directly its "*quantum suff.*" Walking round the College Farm near Tokyo where the second crop (squashes or melons) was being planted in the furrows between the ridges of barley, the question whether the unexhausted manure already given to the standing barley would suffice for the melon crop, was hardly understood; the idea of putting down a second, even a co-existing, crop without first applying the manure necessary for that crop or continuing the doses during the crop, was unintelligible; as mentioned under "manures," a ladleful of fertiliser

* Cato ("De re rustică") says "Quid est bene colere? Arare. Quid secundo? Arare. Quid tertium? Stercorare.

(probably liquid excreta) would most certainly be applied to each patch where a seed would be sown or seedling planted out, the earth mixed in, the seed or plant placed in position a day or two later, and subsequent manure given as needed. The Japanese looks on the soil rather as an instrument or vehicle for converting his manure into crop than as a source of crop in itself, and this is the secret by which Japan has not only maintained the crop-bearing capacity of its soils, but has brought poor soils into fertility.

61. To do this Japan is compelled to utilize every scrap of waste material; for many centuries she has been isolated and self-contained; hitherto she has discovered no internal sources of mineral manures (phosphates, etc.) and, except for the produce of the sea, she has therefore depended upon returning to the soil everything that has been taken from it in the way of crops, together with leaves from forest areas; in many cases, she has cropped poor surface soils with trees till their fertility has been improved from the deep sub-soil, the cultivation of small woods being part of a Japanese quasi-rotation. Not only so but Japanese farmers understand, and act on their knowledge, that even with their excellent rainfall, soils physically defective, especially those deficient in hygroscopic capacity such as the sandy soils of the coast, *must* be ameliorated by sheer labour in the supply of the necessary additions of humus, loam, etc. Consequently the supply of abundant vegetable matter forms part of the general manuring system especially on sandy and dry soils; the compost heap is found in every farm-yard, and quantities of vegetable matter from the woodlands, etc., refuse of towns, seaweed, loam from low-lying lands, the clearing from the irrigation and drainage ditches, etc., are everywhere used for *dry* as well as wet lands, while a green crop (astragalus) is habitually grown or allowed to grow for the special green manuring of paddy fields or for the compost heap.

62. A bulletin by a European professor of the Agricultural College in 1882 says: "There exist among the Japanese fertilisers, many of which, with due regard to composition as well as copiousness, are well suited to supply the demand of the cultivator for nitrogen. An improved and extended system of taking marine animals, a more extended cultivation of leguminous plants, especially the introduction of leguminous forage crops for the working animals, and a large supply of green manures from the uncultivated land, would render the country independent from without for a supply of nitrogenous fertilisers. Concentrated phosphatic manures of frequent and copious occurrence, are, however, conspicuous by their absence. Hence the importation of fertilisers of this sort, lately commenced in several places,

deserves the unanimous approval and support of all those who are interested in the welfare of the farming classes."

63. The classes of manures, especially that of human excreta, are dealt with at length, *s.v.*, "manures"; suffice it here to say that the third great characteristic of Japanese cultivation is manure; not merely the use of manure, but the utilization of all waste as manure; everything organic goes into the arable field.

64. *Modes of application.*—Manures, as a rule, are applied only as liquid manure (X) or in a finely pulverized form. As shown under "manures," X is used largely diluted according to the time of year, nature of the crop, etc., while most other manures such as fish, oil-cake, etc., are divided as finely as possible and composted with vegetable matters, lime and shells, earth, ashes, pulverized bone, etc., and allowed to ferment until the whole is a finely powdered mass called "manurial earth." At sowing time the liquid manure is poured into the furrows at the spots where plants or seeds are to be sown, and the earth then well mixed up with it and the plants, etc., put in, or over the mud of the paddy fields just before transplantation, while the compost is spread as a fine layer in the seed drills just before the seed is sown, and the seed is then strewn immediately on the manure, or a little fine earth is first mixed with the manure and the seed then sown and covered over. During the growth of the plants, chiefly on upland fields, the earth between the plants is frequently hoed over and at each time a small dose of liquid manure is given as a top dressing. The Japanese principle is small doses and often; the first manuring is called the "germinating" dose, and the plants are subsequently fed with periodical doses as they appear to need them; hoeing and manuring are given from 3 to 7 times during a crop, says Dr. Shinkizi Nagai, and the last manuring is given just when the plants are coming into ear or pod.* Heavy doses are never given, and the ordinary Western plan of huge applications before the crop is sown of the whole manure supposed to be needed by the crop, is unknown; the Japanese plan seems economical, prudent, and sensible, and is in accord with their

* The practice of giving *frequent small* doses of X during crop is scientifically correct. For its nitrogenous organic matter rapidly assumes the form of nitrates, and if it were given in one large dose before sowing, part would be washed down into the sub-soil before the roots could absorb and assimilate it; again, owing to the abundant initial supply the plants would absorb a great quantity of N in their early stage and would tiller abundantly, but in their later stages, which also require N_1 they would fail to find a sufficient supply within reach and would thus suffer from nitrogen hunger and be defective in yield of grain. Hence the Japanese, especially in summer, are justified in manuring only by small and frequent doses according as the plants require N and are able to assimilate it. This is one of the conclusions found in an Agricultural Bulletin by Dr. Kellner and others of the Agricultural College.

principle of direct feeding of the plant and not of the soil. Dr. Nagai, as others, considers that it is to this method that is due the fact that from time immemorial the same crops have been grown on the same fields and with similar annual outturns; manure to *every* crop, even to the first crop on virgin soil, and in small but repeated doses; manure gathered from every available source, treated with the utmost solicitude and care, and applied in the most economical and commonsense manner.

65. Following the general Japanese practice of manuring each crop, the following mode of use was personally noticed as general in the uplands. Seed is *never* sown broadcast but is usually hand sown or dibbled in rows; a few days before sowing X was diluted with about its own or twice the volume of water, carried by tubs on a kàvadi to the field to be planted, and ladled out by a long-handled scoop to the spots where the seed or young plants were to be placed; *e.g.*, if squash seeds or young cabbages were to be put in the furrows between the ridges of barley a quart or so was poured out at each spot; next day the earth was well mixed up, and a day or two thereafter the seed or plant was dibbled in. At several periods during growth small quantities of X diluted up to even ten times according to the weather and the nature of the plant, were administered, it being an axiom, not only that a young plant must be fed while growing, but that the individual doses of this nitrogenous manure must be moderate; the last dose is given about flowering or earing time. X was applied simply as a liquid manure except such portions as were contained in composts which are moistened with urine; it was not used solid but largely diluted, just as liquid manure is used in Flanders where similar handscoops were often used.*

* There is a curious likeness, *mutatis mutandis*, between the Flemish cultivation methods and those of Japan, especially in the matter of tillage, of the bringing of poor lands to fertility, and of the character and use of manure. To draw a complete parallel would be interesting, but present space does not permit. But in the matter of manures it is well to point out the similarity; writing in 1819 the Rev. T. Radcliff pointed out the dependence of the Flemish farmer on constant manuring "the sure test of an inferior soil, yielding nevertheless by this attention, an average produce exceeding that of other countries." He says that the trade of collecting manure is carried on by numbers "with unceasing industry;" that "every substance that constitutes, or is convertible to, manure is sought after with avidity which accounts for the extreme cleanliness of the Flemish towns and pavements, hourly resorted to with brooms and barrows as a source of profit. Even the chips which accumulate in the formation of wooden shoes worn by the peasantry are made to constitute a part of the compost dung heap; and trees are frequently cultivated in barren lands merely to remain till their deciduous leaves shall, in course of time, have formed an artificial surface for the purpose of cultivation."

Among the chief of these manures is liquid manure which is most carefully collected. Recognising by experience that the chief fertilising element of manure is in the urine, the Flemish farmer forms underground reservoirs in his

In China very generally, in Japan perhaps less often, seed is, it is said, steeped in dilute liquid manure until it begins to swell and germinate; this is said not only to ensure good germination but to save seed, to assist early growth, and to destroy fungoid diseases.

66. It will be understood, of course, that X is only one of the manures applied even by the most ordinary farmer; he buys fish manure and oil-cake if he can afford it, but in any case he composts every organic matter that he can get hold of (except fæces) and moistening them with urine makes a most valuable addition to his stock of manure; all sorts of vegetable matter are also used, as in India, on his paddy fields. Hence the soil is kept in good chemical and physical condition which would not be the case if X alone were used.

67. It has not been possible to frame any estimate of the amount of manure used for an ordinary crop; observers state that a Japanese farmer regulates the area of his crop by the quantity of manure available, but this is not clear. Taking X as one and the most prevalent form of manure; there are 48 million people, and scientific Japanese experts estimate that of their excreta only about 25 per cent. is wasted; hence the excreta of 36,000,000 people are used for about 12·7 million acres or nearly 3 persons (of all ages) to one acre; this, excluding young children, would

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farm-yard into which drain not only the cattle stalls (cattle are mostly stall-fed) but the dung-heaps, and to this are added the contents of the privies both of the farm and of the village or nearest town, as a most important element; X is known in Europe as "engrais Flamand," though also much used in parts of France and Germany. These "vidanges de latrines" are collected with great care; as in Japan the stuff is carried by wholesale purchasers in boats along the streams and sold to the farmers *en route*, or is stored in masonry cisterns of given capacity and sold by the cistern; peasants who do not live along the rivers buy direct from the householders in the towns, who sell the contents of their privies for a small price.

Besides these farm-yard reservoirs the farmer has others, as in Japan, on the borders of his fields, from which he raises the stuff by a wooden pump into a cart from which he allows it to flow where required; sometimes, just as everywhere in Japan, it is ladled to the required spots by labourers armed with long-handled scoops. It is used very largely diluted and is most desired on the lighter and poorer soils. It is usually enriched by dissolving in it rape-cake which is pounded small and thrown into the cisterns; here it speedily ferments and dissolves.

For the results, the accounts of Flemish agriculture must be read if they cannot be personally seen; but the outturn of Flemish husbandry and the power of the farmers to make loan and even barren soils productive are well known and are largely attributed to the use of this liquid mixture, which, consisting both of X and of the best parts of cattle excreta and further enriched by the addition of oil-cake, is probably superior even to that of Japan.

If, says Mr. Radcliff, a farm looks poor and the reason is asked, the neighbours will say of the owner "Il n'aime pas les *bons-bons*," by which expressive term they indicate their favourite manure tanks and their contents.

give perhaps 1,600 lb. of this manure alone, besides large quantities of fish, oil-cake, stable manure, green manures, and many miscellaneous items. Dr. S. Nagai mentions from 540 lb. to 675 lb. per acre of fresh excreta as the usual quantity per crop, so that twice that amount is given per annum on double crop land; this approximates to the above rough estimate. However, the point to be noted is that the Japanese waste *nothing* that can be used as a crop fertiliser, and are passed masters in its manipulation and use.

Rotations.

68. Strictly speaking, there is no system of rotation in Japan; on rice lands paddy is grown continuously year after year; on uplands wheat, barley, beans, and rape grow together or follow one another, year after year, in any order, the place of rotation being taken, as at Rothamsted in the case of continuous wheat, by the application to every crop of its own full dose of complete fertiliser coupled with most thorough and deep tillage. But the invariable growth each year of beans and other legumes on some part of every upland field, whether in ridges alongside of wheat and barley or in separate plots, to some extent takes the place of a rotation, and assists the soil to nitrogen; similarly on some of the wet lands beans often find a place as part of the second crop, and a considerable area of such lands is covered, by cultivation or otherwise, with the Astragalus lotoides (sinicus), which plays a similar part in fixing nitrogen, being one of the Papilionaceæ. Moreover it is common in Japan to transfer assessed arable land temporarily to wood, by growing a crop of some sort of pine; after some years this crop is cut down, sold at a good profit, and the land reconverted to arable; this practice was distinctly visible on the journeys made in preparing this note.

Stock.

69. Except in certain limited areas live stock is not to be found; horned cattle and horses are used for tillage to some extent in those tracts, but most of the few Japanese cattle are used for draught purposes outside of the farm; effort is being made to introduce cattle labour—which seems contrary to the general Japanese conditions of cultivation—and in one district newspaper I saw a congratulatory notice that about $\frac{1}{10}$ of the fields had been so cultivated that year. For the bulk of the Japanese farmers live stock for any purpose, tillage, dairy, slaughter, or manure, is non-existent; there are not more than about 1·3 million horned cattle and 1·5 million horses of every class and age in the whole country. Sheep and goats are practically non-existent, and the

swine (180,000) not much more numerous; fowls are probably under-estimated at between 10 and 11 millions. One consequence of this is that implements are simple and cheap; the fork, hoe, reaping hook, tubs for carrying manure and a ladle for using it, are almost all that are needed for field work, and the average value of such tools per farm is officially placed at Rs. 4. With these simple implements the Japanese farmer produces his splendid results; though everything is sown or planted with beautiful precision it is by hand and not by machines, and it is the laborious use of the hoe and fork which gives the depth and tilth which are not merely characteristic but counteract vicissitudes of climate and both increase and steady the yield; they dig, and dig, and dung.

MANURES.

70. Under the head "Manuring practice," a general description has been given of Japanese carefulness and methods; details will now be given regarding classes of manure from a consideration of which lessons may be drawn for India, viz., human excreta, fish fertiliser, oil-cake, compost, green manure and stable manure.

Human Excreta.

71. For various reasons the symbol X will hereafter be used to denote this fertiliser considered in its natural combination of both fæces and urine together, a symbol the more fitting since, in India, it is a manurial factor of practically unknown value. In Japan, as in China, its value is not only well known but it is a *sine quâ non* in agriculture; for ages it has been the chief fertiliser in use, and just as labour is chiefly that of man and not of beast, so is the manure. Japanese cultivators will hardly believe and they entirely ridicule, the non-use of X in India and its neglect is condemned as wicked waste. Just as it is the invariable Japanese principle to manure each individual crop with the expectation of a definite amount of produce in return, so, conversely, on taking a crop out of the soil the farmer expects and intends to put back as much as possible of this crop as manure for a succeeding one; and by adhering to this maxim of cultivation he dispenses with the rotations and complex rules of Western farming and grows the same crops year after year on the same land, replacing rotation by a simple circulation of crops, manure, and crops again. If he gets a crop of 60 bushels of grain he expects that the share which he and his family eat shall, as far as possible, be returned as X to his field, while the share which he sells to the nearest town he endeavours to recover by purchasing the town night-soil. Every Experimental station and farm, every Agricultural college or school, uses X on its lands as a matter of

course, analyses its composition, experiments on the best methods and conditions of its storage, use, dilutions, admixtures, and so forth; the practical bulletins issued by the stations and hung up in the schools and farmers' cottages deal constantly with the best treatment and application of this substance and the yield to be obtained by its use alone or in various admixtures; X, in short, is treated not merely as a factor of known value but as an *essential* in farming. Considering that this fertiliser contains in itself, if completely collected and used, all the constituents of the food which consumers eat, it is obviously advisable for even the richest of countries to replace those constituents in the soil. For a country like Japan almost without farm live stock, formerly debarred by its isolation from buying fertilisers *ab extra*, and without native resources in mineral fertilisers, it was and still is an essential if soil bankruptcy is to be avoided and the fields maintained in a condition to support their cultivators. In a poor country like Madras which, over vast areas, is naturally blessed neither in soil, climate, nor resources, which misuses* its cattle manure, knows nothing of fish or bone as fertilisers, practises little green manuring except for rice, and poisons itself with the natural fertiliser festering on its village-sites, the proper use of X is all-important agriculturally and hygienically; properly used it would be of the highest assistance not merely in the improvement of the soil, but in preventing its degradation to that minimum of productivity which, meagre in normal years, disappears entirely in seasonal conditions which a healthy, well worked, and well nourished soil would successfully resist. This secret has been

* In writing thus, *e.g.*, in employing the word "misuses," I write in no captious spirit of censure; no one who has spent nearly 40 years in wandering up and down the country can fail to recognize or sympathize with the difficulties and limitations of Madras cultivators and cultivation; no one is more conscious of the necessary effects of external conditions not always within the cultivator's control and often entirely beyond it, of history, climate, temperament, poverty, of centuries of destructive internecine war and disorder, of fiscal errors and administrative shortcomings, of educational defects and individual inability to escape from tradition and routine. Nevertheless it is misusing cattle manure to burn it as fuel or to use it for plastering walls, floors, verandahs and pavements; what we have to do is to find methods to enable ryots to substitute wood as fuel and some other substance as a domestic wash, and from long experience I say positively that with very little effort, practically no expense, and not only without crop loss but at considerable gain to the ryot, firewood and timber *can* be grown by himself on his own farm except, perhaps, in the purely wet areas of the great deltas. It is misuse of cattle and of their manurial products, to feed or starve the cattle as at present, or to lose the urine and valuable constituents of the droppings by faulty methods of gathering them, or by the wasteful method of grazing them on unproductive wastes. These are all matters of a better rural economy, and the sole object of this note is to assist in its development by suggesting the better utilization, *more Japonico*, of many matters now actually available but which are either waste, unprofitable, or even noxious.

seized by the Japanese; of manures other than those arising from farm products, except a moderate amount of fish and bean-cake—the latter developed only of late years to present proportions—they have none; yet their fields have been brought from very moderate to very considerable fertility and have been so maintained for centuries, and this success must be attributed, so far as manures are concerned, mainly to the use of the natural fertiliser which is at every one's doors and is yet so strangely neglected in India, one of the poorest of countries. If Japan is not sufficient to point the lesson, there is China which supports an enormous population, so dense that much of it lives on the rivers, and does so without extraneous aid, largely by the use of this natural fertiliser. There is absolutely no doubt of this, viz., that it is by the use of X and mainly by its use—so far as regards manure and not tillage—that Japanese soil maintains its millions in comfort and is a model of success for Indian petty farmers.

72. The matter will, therefore, be dealt with at length and plainly; unusual, and, in a way, repulsive as it may be, it is a subject of the first importance in India, a matter of many millions sterling annually in crops, a factor of good cultivation, of healthy, fertile soil, of resistance to drought and protection against famine, a hygienic and agricultural reform. It has been touched on in my Manual of the Coimbatore District in words which have the full approval of Dr. Voelcker in his Report on Indian Agriculture, but a journey in Japan absolutely compels a free treatment and a vigorous advocacy of it from every point of view and with all possible insistence.

73. *Collection of X.*—The village practice is as follows: to every cottage is attached a privy; *lucus a non lucendo*, for it is distinctly or prominently in evidence even to wayfarers. A small shed, often on the side of the road, concealing or indicating a large tub or earthenware vat, sunk in the ground and covered with a board having a rectangular orifice, serves for household use, and a separate tub forms a urinal but is frequently so placed as to open on the road side—with also an orifice from the privy proper—and thus attract the welcomed attentions of wayfarers; this last is easy since in order to save cultivable space Japanese villages are frequently single long streets straggling along the sides of the highway. The contents of the main tub are transferred in buckets to a storage vat in the homestead or taken to vats in the fields, while the urinal is frequently emptied and its contents mixed with the more solid contents of the privy tubs or poured over the compost heap. Throughout the fields, and usually by the side of the field paths, there are storage vats of considerable size and covered with close straw roofs to minimise the circulation of air and consequent loss of ammonia, and to keep

off the rain and sun. So complete and regular is the use of the privy and urinal whether one's own or another's, that (as others also have testified), in the frequent village tours of two months I only once saw fæces lying in a wrong place. Dr. Maron says: "In all my wanderings through the country, even in the most remote valleys, and in the homesteads and cottages of the very poorest peasantry, I never could discover, even in the most secret and secluded corners, the least trace of human excrements. How very different with us in Germany, where it may be seen lying about in every direction, even close to privies!" The latter sentence is equally applicable to this Presidency. The completeness of collection is also shown by indigenous opinion; in a Bulletin of the Central Agricultural Station the loss in the mere collection of X (not including volatilisation) is put down at only 25 per cent. of the total excreted in Japan, a marvellous fact considering the necessary losses in cities, in the imperfections of privies, etc. In fact, the Japanese obtain and store by far the greatest part of the excreta of the country; Japan loses them, India uses them, only by accident.*

74. In towns and cities methods are necessarily different; household arrangements are similar as regards the privy, but

* In China there is equal carefulness both in collection and use as personally noticed ("seen" does not, as to use, quite cover the mode of observation) in a long country excursion outside of Shanghai. I have been informed by very high authority that irrespective of private household arrangements exactly similar to the Japanese, there is at both ends of each village a public latrine and urinal for the use of wayfarers and others so that nothing may be lost by the wayside In the works of Liebig (*e.g.*, "Letters on Modern Husbandry") and in travels such as those of Davis and Fortune, Chinese methods are described, but they are so very similar both in the collection, transport, and use of X, to the Japanese system, that they need no further description; the important point is that in China, as in Japan, every atom of X that can be collected is used whether by steeping seeds in diluto X till they swell, by pouring liquid X into the spots to be occupied by seeds and plants, by top dressings while the plants are growing, by adding urine to the compost heaps, by mixing X with any other sort of manure, and so on. It is also stated that the solid faces are often dried into bricks and in this state sent about the country, being broken up and diluted when required; possibly some chaff or even husk may be used to assist drying and cohering but this is not stated. Moreover, the authority mentioned also states that, with characteristic Chinese ingenuity, villagers contrive to *attract* the droppings of the much used donkeys and mules (the plan does not succeed with horses) to particular spots on the roads by odorising such spots with donkey droppings and urine; no passing donkey or mule fails to respond to the suggestion.

In a paper in French by Mr. Imamura Warau, being apparently a translation from a Japanese work on agriculture, it is said that excreta are similarly dried in the sun, X being added three times; the product must be kept from rain. Another recipe is one part of fine red earth, one part of fine black earth, and one part of X mixed into a paste; ashes of straw and rice husk may be added; the mixture may be used after 50 days. But it is not clear whether this is actual Japanese practice; I saw no trace of it anywhere.

much is necessarily deposited in public latrines and urinals. The municipal corporations are not only put to no charges for removal either of private or public dejecta, but derive an income by selling the right to collect X from their public places of resort. For, in broad outline, the practice is to license either farmers or regular scavengers to remove X from the city; a farmer obtains the right to clear the privies of such and such houses, usually visiting each house with his buckets twice a month and removing the contents to his farm in the country; regular scavengers obtain similar rights and remove the spoil in buckets to boats which ply on the numerous canals and rivers, as in Tokyo; the boats take these loads up stream to the fields where the contents of the buckets are sold to the farmers for storage in their field vats. Nor do the householders pay anything as the cost of removal; on the contrary, it is the farmer or scavenger who pays each householder at certain rates for the privilege; in Tokyo the rate a few years ago was about 25 sen (six pence or six annas) per person per annum, but it is now 50 sen and will probably rise as prices of grain and of other manures rise. The price is paid either in cash or kind, the farmer bringing vegetables, radishes, and so forth in exchange for what he removes. The disagreeables of the process are minimised by attentiveness and care; the buckets, which are the usual very neat pinewood buckets so universal in Japan, fixed on hand carts and drawn by manual labour through the streets and lanes, are closed with tight fitting lids, and the tubs are kept scrupulously clean externally. But notwithstanding precautions, the transit of these is disagreeable (at least to Europeans, for Japanese and Chinese appear to feel no inconvenience) to passengers in the streets especially where the streets converge into the highways leading into the country; it would, apparently, be easy to fit double lids filled with fibre or other substance charged with a deodorizer in order to minimise the smell; even the present lids are an innovation, for Alcock, writing in 1857, expressly alludes to these as open except when carried on horse-back.

75. *Methods of storage and use.*—X is *never* used fresh and according to all my enquiries and observations, to numerous writings, and to official bulletins, Rein is mistaken in asserting that it is so used. It is too strong and causes the plants to wilt probably because the urea is undecomposed and cannot in that form be taken up by the rootlets, so that the soil becomes loaded with matter faster than it can decompose it. Moreover since urea stands in solution in the soil and is not held by it, it is apt to be washed out by heavy rain and is therefore lost to the farmer. Hence the farmer is justified scientifically in his empirical method of not using X fresh. In any case, since it is used only on

occasions however frequent, it necessarily follows that much of it accumulates gradually in storage and is therefore fermented when actually used; the contents of the field vats is a further proof that only fermented stuff is in use; ten days to a fortnight are recommended as the *shortest* time for storage and fermentation. The material is allowed to ferment under bacterial influence till it assumes a greenish colour and peculiar odour, at which time it is a homogeneous, semi-fluid matter; water is frequently added even in the storage vats. During this process there is necessarily, especially in warm weather, a loss of ammonia, but scientific investigation shows that if care is taken closely to cover and shade the vats, the loss is not great over short periods, and decreases proportionately as the stuff grows older. The following table is based on a paper published in 1887 by the College of Agriculture and shows the loss when the tubs are covered to prevent needless circulation of air and exposure to rain :—

Percentage of original nitrogen lost in

Winter. 3 weeks.	May 3 weeks.	May–June 7 weeks.	May–July 11 weeks.	July 2 weeks.	July–August 5 weeks.
6·0	6·3	13·9	20·1	5·0	12·7

76. It will be seen that over short periods the loss of nitrogen is not very great, though in India it might be more considerable. The investigators therefore consider it not absolutely necessary, though useful, to add materials to absorb or fix the ammonia; when visiting the College farm it was stated that admixtures were neither common for such purpose nor deemed essential if such loss be minimised by close lids and roofs to keep off air and sun, and none was being added to the stuff collected either in the College demonstration farm vats or in those of a large A class Agricultural School. But as will be shown below, *s.v.* "value", it is necessary in order to make X into a complete manure to add phosphate of lime and other matters at one stage or other of its storage or use; apparently straw causes loss of ammonia if applied during storage; see below.

77. The following recent paper translated from one of the many "Practical Hints to Farmers" which are issued in simple form by District Agricultural Experimental stations as the result of actual farm experiments, is instructive; it is printed in the form of a broad sheet to be hung up on a wall for constant reference, and is given not merely for its own value but to illustrate the work being done by these numerous local stations :—

"*Preservation of human excreta.*

Method recommended by the Aichi-ken Agricultural Experimental station as the result of experiment.

In Japan and China human excreta are utilised as a farm fertiliser. In Japan a person produces on an average about a hundred kwam (825 lbs.) or 2 koku (80 gallons) of excreta per annum. Hence fifty million people produce * a hundred million koku of excreta worth fifty million yen (£5,000,000 sterling) at the rate of 50 sen (½ yen) per koku.

The nitrogen in human excreta very readily escapes in the form of ammonia which produces the peculiar smell of this substance. Hence great care must be taken to prevent the loss. As the method in use by farmers in this prefecture (Aichi) was imperfect in this matter, several experiments were undertaken and as the result, the following remarks are issued to our farmers for improvement in this matter:—

(1) When human excreta were preserved and fermented in a free supply of air, 80 per cent. of the nitrogen took the form of ammonia.

(2) When human excreta were left in the open sun in an open vessel, they lost in the first month four to five times, and in the second month two to three times the nitrogen which was lost when preserved in a closed vessel (covered with lid) and in shade.

(3). When human excreta were left for five months in a closed vessel in the shade, the quantity of nitrogen contained in it was 50 to 60 per cent. of the total quantity of nitrogen which it contained at the beginning, while it was only 20 to 40 per cent. when preserved in a vessel without lid and in the sun.

(4) To prevent the loss of nitrogen 1 to 3 per cent. by weight of phosphate of lime was added.

* See later on as regards the quantity of X. In the above figures the word "produce" must be taken to mean "produce *net*", *i.e.*, the value at the time of actual use after deduction of losses both in collection and by volatilisation. For, as regards collection, a Central Experimental Station bulletin gives the gross "production" as 2·67 koku by volume of which 25 per cent. is lost by various causes, leaving a net produce of 2 koku. As regards volatilisation, it will be noted that the value is put down at only one yen (Rs. 1-8-6) whereas at the Japanese rate of nearly 9 annas per lb. for nitrogen, the value of two koku would be 1·72 yen (Rs. 2-10-6) for N alone, *plus* the value of phosphoric acid and potash; if an average loss of 25 per cent. N by volatilisation as ammonia be allowed, the value would still be, for N only, 1·29 yen. Again Dr. S. Nagai mentions the price recently paid in towns for X as 50 to 75 centimes per quintal of 50 kilos, or say, 6 annas per cwt., which equals Rs. 2-13-0 per 825 lbs. or 2 koku. Hence it is clear that the rate of 50 sen (0·5 yen) per koku or 1 yen per average person excreting 2 koku, is a cautious estimate of the net value of X as actually used in the fields.

(5) When stored in the open sun the larger amount—3 per cent. of phosphate of lime—was effective in preventing the escape of N; in shade up to 2 per cent. was effective and more was found useless.

(6) Compared with human excreta preserved in the ordinary way, that to which the phosphate of lime was added lost only 20 per cent. The addition of straw caused great loss.

We recommend therefore the following method:—

Put the excreta into an impermeable pot or other vessel and cover it closely with a lid and keep it in the shade. The addition of 2 per cent. by weight of phosphate of lime will be very useful, but the addition of straw is injurious. Instead of phosphate of lime (1) gypsum, (2) dried peat in powder, (3) dry powdered clay, (4) powdered charcoal, (5) sawdust, may be used for the same purpose."

78. Another bulletin (of the Central Experimental Station) states that the farmers do not keep the stuff for long periods and that it is usual to dilute it considerably (during storage), so that the average loss of ammonia may be taken as only 3 or 4 per cent. during a period of three weeks. It will be remembered that the stuff is applied several (sometimes 6 or 7) times to each crop and that there are two crops per annum over all the dry lands (of the south) and part of the wet lands; hence, omitting the months of deep winter, it is probable that X is seldom much above a month old.

79. Experiments were conducted in a branch station on the subject of ascertaining and minimising the loss of nitrogen (N); the period of storage was one month, and the value of N was taken as 3 yen (Rs. 4-9-6) per kwam or 8·9 annas (say 9) per lb. The following table gives results; the fractions are slightly rounded:—

Method.	X, in winter.		Urine, in summer.	
	Loss of N. per cent.	Value lost out of Rs. 4-9-6.	Loss of N. per cent.	Value lost out of Rs. 4-9-6.
		Rs. A. P.		Rs. A P.
1. Pot buried in ground, without lid, under shed.	21·8	1 0 0	67·5	3 0 0
2. Pot buried in ground with close fitting lid luted with clay.	5·6	0 3 9	48·0	2 3 0
3. Pot buried, etc., with close lid but not luted.	6·9	0 5 0	66·8	3 0 0
4. As 3 but diluted with equal quantity of well water.	6·7	0 4 10	60·8	2 12 0

Hence the second method is the best, but the third probably the most practical.

80. The Station further enquired into the result of additions intended to fix the ammonia; especially of acid superphosphate. It was found that from 1 to 3 per cent. much reduced the volatilisation especially over long periods and in the case of urine; it reduced the loss by one-third in two months even when X was kept in an open vat exposed to the sun. As shown elsewhere, X requires extra phosphate of lime to be a complete fertiliser, so that, when procurable, the addition of, say, 2 per cent. of acid superphosphate would seem desirable; the next experiment, however, showed that, by the presence of any starchy or other substance capable of reducing the acid, the loss of N as ammonia was increased.

81. On the whole, the conclusion arrived at was that for practical purposes the best method of preserving N is to keep X in a vat buried in the ground, with a close lid and in the shade; the addition of superphosphate up to 3 per cent. is good if the stuff cannot be kept in the shade, but in no case must straw or starchy substances be added.

82. *Quantity of X.*—To judge by the reports quantity is less than in Europe. In the "Practical Hints to Farmers" quoted above, it is entered as two koku or 80 gallons per person, that is, for fæces and urine together; this obviously refers as an average to persons of all ages taken together, for the paper simply multiplies this quantity by the *whole* population in order to get the quantity and value of X for the country In a bulletin of the Agricultural College the amount obtained on an average by farmers from city households is given as the above amount per adult, but this is merely the amount "obtained" and there is necessarily not only considerable wastage in privies cleaned only twice a month, but in city life a great deal, especially of urine, is passed in public places of resort; moreover everyone over 15 is considered as an adult when bargaining with farmers, though, *per contra*, children under 10 are not counted at all and two children between 10 and 15 as an adult. In China it is recorded that a household of 5 persons yields 20 hectolitres or 440 gallons, that is, 88 gallons per head in a mixed household. In a bulletin of the Central Agricultural Station, Tokyo, it is stated that "the excreta of one person in Japan per annum are 132 kwam (1089 lb.) by weight or 2.67 koku (106 gallons) by volume, and contain 5·7 kwam (47 lb.) of dry matter. Of this 25 per cent. will be lost by various causes. Hence the 50 million of Japanese produce 100 million koku of excreta worth 50 million yen." Here the word "produce" as in the Aichi Station bulletin mentioned in paragraph 77, clearly means produce *net*, after allowing for losses

in collection. The amount seems high but is given as stated.* Hence it may be taken that the estimate of 80 gallons or 825 lb. per average person, that is of all ages (other than infants in arms) taken together, is a fair estimate of actual production in Japan.

83. The weight of this amount is about 825 lb. (100 kwam, which is elsewhere noted as the actual outturn of city house privies), and though not so stated, is probably made up of 115 lb. fæces and 710 lb. urine (sp. gr. 1·02) or 5 oz. and nearly 31 fluid oz. per average person daily. That this is fairly correct may be judged by comparing European figures; Dr. Parkes gives 2½ oz. and 40 oz., Letheby 2¼ oz. and 32 oz., Frankland 3 oz. and nearly 40 oz., respectively per person of all ages together. In Japan, as is usual amongst persons chiefly vegetarian, the solid fæces are more abundant containing much more water than in Europe; in Europe 4 ounces (adult male fæces) contain 1 oz. dry solids but in Japan only 0·5 oz.; consequently Japanese fæces, containing the usual 1 oz. of water-free solids, will weigh 8 ounces, and, at the accepted rate for a general population of ⅘ of adult production, 5 oz. will be fairly correct. Urine has been taken at 30 to 31 oz. allowing for the difference in bodily weight.

84. Turning these figures into gross annual production we get figures which *command* attention. For a million people per annum the gross weight will be 115 million lb. fæces and 710 million lb. urine, or 825 million lb (=368,300 tons) of X; or in another way, about 50,000 tons of fæces and 69,000,000 gallons of urine. Hence for Japan with 48 millions (present population) the annual gross outturn of X will be 39,600,000,000 lb. or 17,678,500 tons (separately 2,464,250 and 15,214,250 tons) or enough to cover at least 160,000 acres one inch deep with the mixture. When it is remembered that the great bulk of this goes not only innocuously but beneficially into soil and crops instead of poisoning the village sites and water-supply, the hygienic value of the Japanese system, apart from its productive value, is apparent without argument. Apart from the chemical value of the immense mass of organic matter, its effect on the physical texture of the soil must be very great.

85. It is true that the bulk of this vast mass is water of no great value except as a necessary diluent and vehicle for application; hence we must consider its value in manurial constituents. A word as to water-free solids; in Japan fæces contain 114 parts per 1000 of dry solids or 11·4%; hence in 2,464,250 tons there will be 281,000 tons of water-free solids; urine contains 32 parts

* In France the average of well-fed persons reduced to terms of the "person of average weight," *i.e.*, of all men, women, and children taken together at 90 lb. per head, is stated at 428 kilogrammes or 941 lb. Another authority gives 971 lb.

per 1,000 or 3·2 % of solids, or in 15,214,250 tons no less than 526,850 tons; it will be noticed that, contrary to general ideas, urine contains in the quantity voided nearly double the weight of solids contained in the fæces.

86. Much of these solids is matter of the highest manurial value; attention will be confined to the Nitrogen (N), Phosphoric acid (PA or P_2O_5), and potash (K). The following table has been drawn up from a bulletin of the College of Agriculture and contains the result of many analyses of fresh excreta in parts *per mille*.

Chief Constituents.	X, that is, night soil from privies; natural admixture of fæces and urine.		Fæces only.		Urine only.	
	Japan.	Europe.	Japan.	Europe.	Japan.	Europe.
Water	950	935	886	772	968	963
Nitrogen ..	5·7	7	10·4	10	5	6
Phos. acid ...	1·3	2·6	3·6	10·9	1·05	1·7
Potash	2·9	2·1	3·4	2·5	2·8	2

The table appears to have several doubtful entries, for the N in European X is usually estimated at 150—155 grains per average person (men, women, and children together) per day or 8 per mille instead of 7 as in the table; the Japanese entry of 5·7 works out to only 87·2 grains per person per day which seems very low. The figure 1·05 under PA in urine (Japanese) is conjectural, as an obvious error (·05) has crept into my notes; 1·05 per mille however is practically consistent with the entry of 1·3 under PA in X. The table if not strictly correct is approximate, and apparently gives minimum figures; Japanese food and weight account for much of the difference.

87. Taking these figures as correct and translating them into quantity, it will be found that X in Japan contains at 825 lb. per person, the following weights of manurial constituents:—

Substance.	X Fæces and Urine combined(825 lb.).		Fæces only (115 lb.).		Urine only (710 lb.).	
1	2	3	4	5	6	7
	Per cent.	Weight lb.	Per cent.	Weight lb.	Per cent.	Weight lb.
Nitrogen ...	0·57	4·75	1·04	1·2	0·5	3·55
Phos. acid ...	0·13	1·07	0·36	0·41	0·095	0·66
Potash ...	0·29	2·4	0·34	0·39	0·28	2·0

The table displays the much greater value of urine than of fæces in X especially in the matter of N; just as in farmyard manure it is the urine which supplies most of the N, so it is in the case of human excreta. Since ordinary English farmyard manure contains per ton about 11 or 12 lb. of N and about 6 lb. phosphoric acid, the excreta of 2½ adults are equal to one ton of such manure as regards N but is short as regards PA. But in farmyard manure nearly half of N. is in a very insoluble and slowly decomposable form, viz. in the fibre of the straw, whereas in X the bulk is contained in a very soluble and fermentible form, viz. in the urine, while even that of the fæces is far more assimilable than that of straw; hence the N in X is more useful and more prompt in action than that of farmyard manure. In comparing the two, only well-rotted English farmyard manure is meant, and not that of India which is usually from badly fed animals and in which urine is greatly or almost altogether neglected except where stock are penned on the land to be manured.

88. The next table contains the actual weights for Japan of the manurial constituents of X and of its two component parts, population being taken as 48 million.

Table.

Manurial Constituents.	Fresh X, *i.e.*, Fæces and Urine together.		Fæces only.		Urine only.	
1	2	3	4	5	6	7
	lb.	tons.	lb.	tons.	lb.	tons.
Nitrogen ...	228,000,000	101,785	57,600,000	25,714	170,400,000	76,071
Phos. acid ...	51,480,000	22,982	19,872,000	8,871	31,680,000	14,142
Potash ...	114,192,000	47,732	18,768,000	8,378	95,424,000	42,600

The practical correspondence between the several figures in columns 2, 4, and 6 show that the assumption of 5 oz. fæces and 30 to 31 urine daily or 115 and 710 lb. annually is correct according to the Japanese estimate; this estimate was not given in the Agricultural College bulletin but was surmised from general considerations; had the assumption been even slightly wrong the combined figures in columns 4 and 6 would not have corresponded with those in column 2. Any slight errors are due to omission of small fractions in the percentage columns of the previous tables. The figures may be checked by calculation on another set of figures entered in another bulletin. In 825 lb. of fresh X, being the amount excreted per person, N is put down as

4·54 lb. PA as 1·07 lb. and K as 2.23 lb. Multiplying these figures by 48 million, N works out at 217,920,000 lb., PA at 51,360,000 lb., and K at 107,400,000 lb., being amounts very similar to those in column 2 which may therefore be accepted, especially as N under this second calculation also, works out at only 87 grains per person per diem.

89. If we say that, according to the analyses available, X in Japan at the time of excretion, contains 100,000 tons N, 23,000 tons PA (P_2O_5) and 48,000 tons K, there is no great chance of material error. But it must be repeated that this is a cautious estimate seeing that in Europe 153 to 155 grains of N and about 30 grains PA per *average person* (men, women and children together) per diem, or 7.8 lb. and 1·56 lb. respectively per annum as against the Japanese 4·6 lb. and 1·07 lb., are recognised as excreted; moreover one bulletin of the Central Experimental Station places the *production* of X at considerably higher figures (paragraph 82).

90. It will be noticed (1) that X is essentially a nitrogenous manure, containing 4·4 times as much N as PA; (2) that the urine is by far the most valuable constituent as it contains three times as much N as do the fæces, 60 per cent. more PA and five times as much K. This second point is of the utmost practical value, for urine is apt to be treated in India as not much more valuable than water; whereas it is this that should be most rigidly conserved. In Europe it is stated to be worth 5 or 6 times as much as the fæces.

91. *Value in Money.*—In England N is valued at about six pence per pound or 11 shillings * per unit of 22·4 lb. or 1 per cent. of a ton, PA at 3 shillings and K at *3s. 6d.*; in India Dr. Lehmann has recently stated the value to be Rs. 10, 3, and 3–8 respectively; in America N is usually valued at about 15 cents (Rs. 0–7–6), while in Japan the Agricultural bulletins referred to valued N at 8·9 annas per pound, a value confirmed by the still higher prices paid for fish fertiliser and oil cake; see paragraph 101 below. Hence 100,000 tons N at 6 pence per lb. or £56 per ton are worth £5,600,000; 23,000 tons of PA. at £15, £354,000; and 48,000 tons K at £17–10, £840,000, being an aggregate of £6,785,000; on the basis given by Dr. Lehmann the values would be Rs. 1000 lakhs, 69 lakhs, and 144 lakhs or, say, Rs. 1,200 lakhs per annum; at Japanese rates it would be still higher. These huge figures call for the most careful attention by

* The present quotation appears to be 12 shillings per unit for N so that the value of N given in this paragraph as £5,600,000 may be raised to £6,100,000; K is also now quoted at 4 shillings instead of 3*s.* 6*d.*

economists, administrators, agriculturists, and sanitarians. The amount and value are in no way exaggerated; for instance, a recent French writer in the "Annales de la Science Agronomique" gives ten francs (8*s.* 4*d.*) as the value of the excreta of a well-fed adult male, or about 5*s.* (2½ yen) for an "average person": the "Dictionnaire d'Agriculture" (Paris, 1898) also gives the total value as about 5s. per head, but N is there entered as 0·88 per cent. or about 6 lb. per head.

92. The above however is the gross amount contained in fresh X, that is at the moment of excretion, and of course the whole of this fertiliser is not available in practice; a great deal is wasted by soakage, etc. in the privies and urinals, much goes into the air as ammonia, some (a very small amount) never reaches the privies at all. But it is strongly insisted on that the merit of Japanese cultivation in this respect is not merely that X is used and used carefully, but that it is collected and stored with *scrupulous care* and the utmost diligence; none is wasted except by accident; the country side may, on manuring occasions, be unduly odorous but *not* as the Indian villages, with dirt in the wrong place; none is seen lying by the wayside, but every facility is given, nay, means used, to attract the attentions of the way-farer. Moreover, as a farmer expects actually to obtain 825 lb. per adult from the city privies which he clears, it is obvious that this is a minimum and that in the country the carefully regulated family privy is at least as productive. The latest Agricultural Bulletin quoted allows 25 per cent. as loss *in collection*, *i.e.* only 75 per cent. of the total excreted is collected, but the amount taken as excreted is larger. As regards loss by volatilisation the table in paragraph 75 *supra* shows that the loss of N does not ordinarily exceed 10 or 15 per cent. since in winter the loss is inconsiderable and in summer the stuff is used up rapidly. If an aggregate loss of 40 per cent. for wastage of both classes is allowed, it is certainly enough; that wastage cannot be more is shown by the best of proofs, viz., the results in soil fertility and crop due, in a once totally isolated country, principally to this fertiliser for, as will be seen below, even fish fertiliser is quantitatively small in its aggregate results. This deduction allows as the net *minimum* practical value or value in use, about £4,200,000 or if valued at Indian rates Rs. 775 lakhs on about 60,000 tons N, 17,000 tons PA, and 36,000 tons K, the loss of these two latter constituents being confined to wastage in collection.

93. The money value may be checked by another method. Price can only be ascertained in towns, where, however, it is low partly because the stuff is superabundant and a nuisance, partly because of the long lead to the fields. In Tokyo 20 years ago

the rate annually paid by farmers or scavengers to householders for the privilege of removing X was 25-30 sen (6 to 7 annas) per adult, persons over 15 being classed as adults and two between 10 and 15 as one adult, while children below 10 were not considered ; the amount actually obtained was calculated at 100 kwam (825 lb.) per adult per annum. If an annual agreement was not made the price paid by the Ka or man's load brought the cost in the city up to between 50 and 60 sen (12–14 annas). But in addition to the above cost, the farmer had to collect and transport the stuff to his fields outside the huge city ; with his handcart and tubs he could transport the excreta of an adult in about two days at a cost of, say, 8 annas ; if he bought the stuff from boats in the canals near his fields at from 7 to 10 miles from the city he would have to pay 60 or 70 sen (15 or 18 annas) for 825 lbs. Hence 20 years ago the farmer was willing to pay in cash and labour from 14 to 18 annas per adult for the excreta delivered on his fields up to 10 miles from the city But in 1906 the price paid to the house holder had advanced from 25 to 50 sen (1*s.* or 12 annas), and since all labour has also gone up heavily, especially near cities, he probably pays not less than from 100 to 120 sen (Rs 1–8 to 1–13) for the same quantity brought to his fields, or on the average 1·1 yen (Rs. 1–10). As mentioned above Dr. Nagai gives town rates as averaging 1·8 yen or Rs. 2–13 as the mere cost of X. The rate given in the bulletins of 1 yen per head is that of 1888, and prices are certainly much higher now. But at only 1·1 yen per head the aggregate money value of X calculated not on 48 million but only on 35 million theoretical adults would be slightly over £4,000,000 sterling at 2*s.* 0½*d.* per yen, which compares well with the minimum figures given in the preceding paragraph and is much lower than the 48 million yen given by the Japanese writers. If compared with fish manure it will be seen that X at the above values is much underestimated or is, according to universal recognition, the cheapest as it is at least the second best of all Japanese manures (*cf.* Kyoshu Agricultural Station *s.v.* " manurial diagram "). For in 1905 the price of fish fertiliser was, according to the official statistical reports, about 2·6 kwam (21·5 lb.) per yen ; that is, at the high rate of 10 per cent. N and 4 per cent. PA, one yen would buy 2·15 lb. N and 0·86 PA. But a yen expended in X will buy more than twice the quantity (4·75 lb.) of N and one-fourth more of PA. Hence the valuation of X at 1 yen per adult is extremely low ; still more so if compared with N purchased in rape cake.

94. *Productive value.*—The above figures are merely the price which the farmer could afford to pay for X if he purchased it. But to him the value is much above the price since he expects from his crops a large profit on his outlay ; hence the value in

crops must be considered. A crop of 900 lb. of wheat or barley and 1,250 lb. of straw takes up 1 unit (22·4 lb.) of N. Consequently 60,000 tons as entered in paragraph 92 *supra*, or 6,000,000 units of N, will suffice for 5,400,000,000 lb. of barley, etc., and 7,500,000,000 lb. of straw, grown, at the Japanese rate of about 1,200 lb. of grain per acre, on 4,500,000 acres. At the Madras rate of cereal consumption per average person (adults and children together) of 450 lb. per annum, the produce would provide cereal food for 12,000,000 persons, exactly one-fourth of the whole Japanese population, besides straw for a million pairs of cattle for a year at 20 lb. per pair per diem.

95. Unfortunately X is not proportionately rich in PA ($P_2 O_5$), so that if the N is to have its full effect upon crop a considerable addition of PA must be made. For a grain crop which requires a unit or 22·5 lb. of N requires 10·5 of PA or 0·47 of a unit, whereas so much X as contains a unit of N contains only 0·23 of a unit of PA or just half the necessary quantity. At 10·5 lb. of PA for a grain crop of 900 lb. *plus* the concomitant straw, the aggregate amount of 14,000 tons or 31,360,000 lb. of that constituent in X would suffice for only about 2,688,000,000 lb. of grain *plus* straw, or just half of that possible with the nitrogen available. Hence, as Japanese agriculturists have been pointing out, phosphates must be added, and there has been a considerable import of late years in answer to the teaching. A certain amount however, is supplied in the bones to the fish so largely eaten in the country and the bones of such cattle as they have; these are all carefully gathered, pounded, and left to ferment in the compost heaps. It seems possible from a consideration of the composition of X, the natural lack of phosphates, and the suggestions of the agriculturists, that the soils of Japan do not produce the full crops warranted by their general fertility and good condition, simply for want of sufficient phosphoric acid to give the available nitrogen full productive scope.

96. The productive value of X may be shown in another way. The average Japanese rural family consists of 5·7 persons; taking it at only 5 and allowing only 2 lb. of X per person per day the annual outturn would be 3,650 lb. containing 17·3 N and 3·9 PA. This quantity of N suffices for 700 lb. of grain and 950 lb. of straw, but some addition of PA is necessary for the actual production of this crop. If the family, at Madras rates of 450 lb. per person, requires 2,565 lb. of grain annually for 5·7 persons, then X suffices to produce above a quarter of such amount. In a homestead very little indeed of the excreta fail to be collected, but wastage of ammonia will of course occur; probably the household X will suffice for fully one-fifth of the house consumption, *i.e.*, for one-fifth of the rural population.

97. But the fact to be grasped is this, that whether the figures be fairly right or even seriously wrong, whether X is worth three million sterling or six, whether it will produce 6,000 or 3,000 million pounds of grain and feed 12 millions or 6 millions of people and 2 millions or 1 million of cattle, it is, at the lowest estimate, a factor of enormous value in or, rather, the manurial foundation of the agriculture of Japan. After every allowance and deduction have been made the broad fact remains that Japanese soils and produce are what they are, so far as regards manure, chiefly by reason of the universal and complete utilization of X, and the matter of its productivity need be no further laboured.

98. But the hygienic importance of burying and decomposing such matters in the fields, away from human dwellings, into wholesome plant food is a matter which cannot be left unconsidered. Objections are made by writers who notice only the annoyance of the odours which occasionally assail the traveller, especially if he is curious enough to wander on country tracks at cultivation seasons, and they put the system aside as impossible in a country of modern ideas even if they recognise its productive value. Yet the stench of drains and sewage gas in many modern towns and houses is worse, as it is more deadly, than the stench of the field vat, and for rural tracts where the choice lies between, on the one hand the scrupulous collection of excreta and their removal first to storage vats and then to the fields, and on the other the leaving of such excreta to fester on the soil, pollute the wells and tanks, and continuously poison the air around the house-sites, the Japanese system is almost ideal. In Japan X is collected into definite covered receptacles chiefly in the fields where it causes no nuisance or danger, and can only be considered an annoyance at the time of collection or use; in India it is allowed all the year round to pollute the air and the water in the most dangerous of places, viz., in or around the village-site; the sun fortunately deodorizes and dries the matter quickly but the first shower reveals the real state of the soil, and with the wind blowing from a large village the fæcal odour has been perceived a full half mile away.

99. The annoyance of the Japanese system may perhaps be minimized by the use of absorbents, deodorisers harmless to crops, etc., but as compared with Indian sanitary negligence or worse, it is even in its present state, infinitely preferable to the mere senses, while sanitarily the two cannot be named together; in Japan the Mosaic plan is improved upon by productive utility added to the deodorant, absorptive, and decomposing powers of dry cultivated soil; in India the rules of nature are outraged. The mass of excreta in Japan would, as stated, cover at least 160,000 acres an inch deep every year, or above 12 acres in each of the

12 to 13,000 villages in Japan; if this were allowed to sink into the soil near the houses, what would be the condition of the soil and the water-supply in the village-site at the end of a century? Is it any wonder that the village drinking-water wells in India are saline and foul with the products of decaying organic matter in the wrong place? This will be further dealt with below *s.v.* "suggestion for Madras."

100. *Fish Fertiliser.*—Consideration of this manure is necessary not only because of its intrinsic value and the importance rightly attached to it by the Japanese, but because this Agricultural note is complementary to the primary object of report, viz., the proper development and use of the fisheries of India as supplies of food and manure. The following extracts from Japanese papers bear directly both on this object and on the importance of fisheries to farmers :—

"The only source of fertilisers other than those produced by the soil from which Japan has drawn during her long seclusion and still draws a constant supply, is the sea with its enormous wealth in animals and weeds. Yet the sea yields at present only a small portion of what it might be made to contribute to the fertility of the land directly by a supply of manures, indirectly by a supply of human food. Fishing, though the occupation of many people, is carried on as yet on rather a small scale and only in the proximity of the shores, and might be much extended by the application of modern methods" (Agricultural College bulletin). This was written about 20 years ago, since which time the Japanese authorities, recognising both the enormous sources of food, manure, and wealth in the sea and the weakness of its exploitation compared with its possibilities notwithstanding the vast quantity actually drawn from it by multitudes of fishermen, have most wisely laboured (see Report on Fisheries) so to organize the industry and trade that the deep sea and distant waters shall yield up their harvest for the sustenance and enrichment of the nation.

101. But it is easier to organize and develop on land the demand for fish food and manure by 5 million farming householders working on 5 million farms, than to develop the supply of fish from the sea by a couple of million fishermen whose boats and gear require immense modification before they can cope with the increased demand, and who must, in any case, face new and great dangers in attempting to cope with it.

For this reason and because, while there is an increased demand for fish fertiliser, there is a still greater demand for fresh fish owing to pressure of population, to concentration of wealth in large and industrial cities, and to improvement of communications, the price of fish fertiliser has steadily gone up to above

twice that of a few years ago and the supply on the market has diminished by about one-tenth. The following table gives prices in pounds per rupee for several years, the rise having been steady throughout; the figures are taken from the official Statistical Reports of 1902 and 1906 :—

Fertiliser.	Pounds per rupee.				Remarks.
	1887.	1890.	1894.	1904.	
	lb.	lb.	lb.	lb.	
Dried sardine ...	35	30	25	14·1	Herring does not appear in the accounts till 1890.
Dried herring ...	...	25	23·5	13 2	

The prices of the last few years are the average of 16 principal towns for sardine and 23 for herring, and probably therefore slightly lower than the price paid by the farmer. These later prices are extremely high; for after allowing 0–1–6 for phosphoric acid and taking N as high as 10 per cent. the cost of the latter in 1904 amounts to 10·6 annas per pound. Consequently foreign sources of fish-manure are being sought, large quantities of oil-cake are coming in from China, together with sulphate of ammonia and phosphates from other countries; the coal of Japan is also, of course, now yielding sulphate of ammonia. It is regrettable that the fishing industry has not been able to keep pace with the demand for fish fertiliser which, in Japan, is the most esteemed of manures.

102. Fish-manure, like X is essentially nitrogenous but contains a larger proportion of phosphoric acid. It is of several kinds, the ordinary sardine and herring simply dried in the sun on the sand; scrap which has been boiled and pressed for oil; and a low grade made from heads, vertebræ, offal, etc., of the larger fish. In 1882, the analysis of samples from seven different sources gave an average of about 10 per cent. N and 4 per cent. P.A, the variations being from 7 to 11·7 of N and from 3 to 4·85 (in one case 5·96) of PA; the lowest figures were in all cases taken from an inferior class of sardine simply dried on the sand and containing a good deal of oil and sand; herring appeared to be superior to sardine as a manure, and the best analyses were from herring scrap from which oil had, at least in part, been removed. From 1882 it is believed that the general manufacture has improved, since the oil, a valuable by-product but positively harmful to the stuff as manure, is now largely removed by boiling and expression; sand, however, is still a trouble and specimens have been shown me in which sand formed 25 per cent. of the

sample while even higher percentages are well known elsewhere in this class of fertiliser; in this Presidency Dr. Lehmann finds an average of 34·56 per cent. (Report for 1903). English reports give for fish guano in general about 6·9 per cent. N and 7 per cent. PA; Dr. Lehmann's Mysore analyses up to 1905 gave an average of about 6 per cent. N and 5 per cent. PA, the highest percentage of N being 8·72 and the lowest 3·96; the samples giving the highest (bungara, mackerel) and lowest (sardine) rates were neither of them "adulterated" and apparently both were merely sun dried; the low percentages of N as compared with Japanese are probably due to the large percentage of oil. Subsequent analyses gave lower rates owing to the excessive proportion of sand. One Japanese sample of fish guano prepared merely from refuse (heads, tails, backbones, offal, skin, etc.) yielded when dried in a water oven 7·85 per cent. water, 6·15 N and 7·64 PA, a very good outturn for the class of material.

103. *Amount and value.*—The 21st Statistical Report gives for 1904 the quantity of fish manure manufactured as 26,278,000 kwam equal to 3,627,800 Indian maunds or 299,293,000 lb. or 133,600 tons. The value is entered as 10·27 million yen or just 3·5 kwam per yen or 19·25 lb. per rupee; these appear to be manufacturing or wholesale prices, for, as shown above, the town market price in 1904 was below 14 lb. per rupee. Hence the price paid in the markets was about 30 per cent. higher. At the average of 10 per cent. N and 4 per cent. PA, there would be about 13,360 tons N and 5,345 tons PA or 1,336,000 and 534,500 units, respectively, worth at English rates £668,000 and £80,000 or £748,000 in the aggregate. Hence neglecting the small value of the other constituents the Japanese were paying per unit for N and PA at least 50 per cent. above English rates and considerably above those fixed by Dr. Lehmann as fair Indian rates. Compared with the cost of N in X it will be noticed that 200 kwam of X contain 9·5 lb. of N and, if purchased, cost the farmer something over 2 yen, while 12 kwam or 100 lb. of fish containing about the same amount of N cost about 3·4 yen at 3·5 kwam per yen or 4·8 yen at 2·5 kwam per yen. Hence as stated above, X is by far the cheapest nitrogenous manure and its true money value estimated in terms of N has probably been understated.

104. *Productive value.*—1,336,000 units of N will suffice for about 1,200,000,000 lb. of grain at 900 lb. per unit *plus* 1,650,000,000 lb. of straw, and since the PA amounts to 534,500 units or 11,972,000 lb. which at 10·5 lb. per crop of 900 lb. suffices for a grain crop of 1,026,000,000 lb. the PA in fish-manure is nearly sufficient for the N. These figures show that the manure supplied by fish though large in itself is small as compared with that supplied by X, since the N in the fish will produce

only little more than one-fifth, and the PA two-fifths, of the grain producible by those elements respectively as contained in X. But the value of a fish fertiliser to the agriculture of a country is well displayed by the use to which it is put in Japan. Its value and the comparatively moderate amount yet in use and the diminishing quantity annually available, explain in part the anxiety of the Japanese Government to develop its deep sea fisheries; it is all very good to take in herring and sardine when they arrive at the door, but far larger supplies are needed for which it is sought to promote the use of much larger boats not only to seek and follow the shoals when found (as in the case of menhaden, etc., on the American coasts) but to go to distant shores and seas (Korea, China, Saghalien, Russia, etc.), where fish are to be found in vast quantities. If this is the need in Japan with already 134,000 tons of fish fertiliser in use on good soils, the lesson for Madras is obvious.

105. Fish is not generally used by itself (except, it is said, for indigo) but in conjunction with other manures, chiefly compost; it is a favourite manure on the tea plantations, which, in Japan, form part of the peasant farmer's ordinary cultivation on the plains; this shrub is said to be manured four times annually, the heaviest dose being given in spring; oil-cake and fish are said to be particularly effective, but in their absence and for the oldest plants, X is much in use. The dry fish scrap is pounded and mixed with fine compost for general use.

106. Dr. S. Nagai mentions the preparation and use of a lixiviun prepared from fish refuse as mentioned above, end of paragraph 102. The heads, guts, skin, bones, etc., of large fish such as the tunny, are collected from the fish dealers or from the restaurants and sent up country. The purchaser puts them into a vat, pours over them the hot bath water from the house (the Japanese bathe daily in very hot water), and repeatedly stirs up the mass, which is then covered up with straw mats and left to the putrefactive fermentation which rapidly sets in. After some weeks the putrified and partly liquid mass becomes of a dark greenish colour with a smell almost insupportable; the liquid part is removed and largely diluted when used; the undissolved residue is used with fresh matter for a new brew. It is said to cause a very rapid development of the plants to which it is applied.

107. *Oil-cake.*—Next to human excreta and fish, oil-cake, especially from beans and rape, is eagerly sought, particularly for special products such as tobacco, cotton, etc. Not only do the Japanese keep in the country the masses of cake from the bean and seed crops which are grown on their own soil but they import largely from China, viz., bean cake from Manchuria, rape from Shanghai.

The quantity of cake manufactured in the country is not known; the output of rape seed on an average of 10 years is 5·4 million bushels or above 270 million lb.; deducting 30 per cent. for the oil extracted, the balance would be 191,000,000 lb. the whole of which was probably utilised as manure seeing that its productive value is highly appreciated; its market price in 1904 on an average of 22 towns was Rs. 3¼ per 10 kwam (82½ lb. or 1 Indian maund), and there were imports of unknown weight, all cake being lumped together in the published returns.

108. The imports of oil-cake are worth study as revealing the rapidity with which the Japanese accommodate themselves to new conditions; whether from the decrease in the supply of fish-manure or from the greater demands of intensifying husbandry or from both causes, oil-cake which, in 1891, was imported to a value of only £35,000, in 1903 was imported to the value of £1,074,000 with a steady rise in intermediate years; the Russian war caused a temporary falling off which has now been made good. The weight in 1891 was only about 34 million lb., while in 1903 it was about 475 million lb. or 212,000 tons costing therefore about £5 per ton; at the town market rate in 1905 of 2·12 yen per 10 kwam (1 Indian maund) the price would be 57·6 yen or £5·18 per ton, or 19 lb. per shilling. It will be noticed that the price rose heavily; the quantity increased 14 fold but the price 30 fold, so that cake was more than twice as dear in 1903 as in 1891 and previous years.

Cotton seed has also been imported since 1896, the value in 1903 being £23,000.

109. About 20 years ago it was calculated that the Japanese paid about 20 per cent. more for N in oil-cake than in fish; at present prices 1,000 lb. rape cake containing about 50 lb. N cost Rs. 39-6-0; 1,000 lb. fish (herring and sardine together) cost Rs. 74-4-0 but have 100 lb. N; 1,000 lb. X cost Rs. 1-14-0 and contain 5·7 lb. N. Hence N in cake cost Rs. 0-14-0 per lb., in fish 0-12-0 but the fish yield also 40 lb. of PA; in X it costs less than 0-6-0 per lb. and there is a good deal of PA also. It is obvious, then, that the Japanese readily pay heavy prices for their oil-cake manures, and their practice is just the converse of the too frequent Madras method of exporting seeds and thus losing both the cake so needed for cattle and soil, the oil, and the oil-pressing industry.*

* Rape cake is largely used in Flemish husbandry by dissolving large quantities in the liquid manure tanks which contain the drainings of the well-paved stalls and stables and of the dung heaps as well as the contents (vidanges) of the town and local privies.

110. The method of using the cake is said to be as follows: it is pulverized, mixed with wood ashes, burnt earth, etc., the mass moistened with stable drainings or urine, heaped and covered with straw; the heap has to be occasionally broken up to prevent undue heating. It is used alone or mixed with compost.

111. *Compost.*—This is absolutely universal as a manure; it is the solid or dry complement of the equally universal liquid X, and is a practical illustration of the "waste nothing" principle of Japanese farming. Every scrap of organic matter is carefully searched out and collected; animal excreta, always excluding human but including those of fowls, and of pigeons which are often kept for the purpose, leaves, weeds, straw and all sorts of vegetable refuse from the town, farm, or house such as potato peelings, radish tops, and so forth, dead silkworms and their pupae, slaked lime and shells, bones of all sorts pounded small, wood and straw ashes, indigo refuse, astragalus grown after a paddy crop, loamy earth, etc., are all pressed into service. These materials are piled up in the yard or under a shed; usually a layer of vegetable matter first, then animal dung, then lime, powdered shells and wood ashes; the mass is then moistened with the liquid drainings from the stable if any, or, more generally, with human urine, covered with earth and allowed to ferment together in a mass which is usually sheltered from the rain by stout straw mats if not under a shed. The mass is occasionally turned over, and is left until the whole has decomposed into a fine, rich, nutrient earth (the Japanese name is "manurial earth") which is passed through a sieve and used as a fine powder, especially at sowing time; the coarse matter which does not pass the sieve forms part of the next heap. Occasionally it is said that the mass is burnt, the resulting black earth being used in the same way.

Compost is of course in use in the Madras Presidency, but is mentioned here, because of the careful way in which everything is pressed into service and in which the stuff is mixed and fermented. The only places in which I have seen fairly approximate care is among the gardens of Salem, and Coimbatore, and in parts of Tinnevelly, especially in the pits into which the village and house sweepings are collected and allowed to ferment, the contents of one pit being used while another is under preparation; the compost is then largely used on the garden lands. In Japan all land is thus manured.

112. *Green manuring.*—This is chiefly practised on rice lands for which it is as necessary as in Madras. Here again everything of a vegetable nature is brought into use; after the paddy land has been hoed over and turned into deep mud, masses of straw

from previous crops, leaves and twigs of trees and coarse grass from the hills and woods, arum and other leaves, old straw sandals, and any other vegetable refuse are spread liberally on the field, the women and children being largely employed in the collection of these materials. But in addition to this, there is, for these lands, green manuring proper; in May large areas of paddy land are covered with the pink flowered Astragalus lotoides or sinicus, one of the papilionaceæ, which, after the paddy crop has been cut in autumn, grows naturally or is purposely sown in the moist field. It is right for cutting, viz., in flower, just when it is wanted, viz., at the end of May, when the land is being made ready for the paddy crop of the wet season, June-September; sometimes it is turned in bodily as it stands, which is the best plan, but more often it is cut and carried green to fields and turned in; sometimes it is thrown into the compost heap; the stubble and roots left in the fields of growth are valuable manure to that field also. When fresh it contains 820 parts water, 4·84 of N, 0·90 of phosphoric acid, and 3·77 of potash per 1,000 parts; dry it contains 2·69 per cent. of N, 9·19 of P.A., while its ash yields 38·44 per cent. of potash. Being one of the papilionaceæ its N is probably derived direct from the atmosphere, so that it is a plant of high value and greatly enriches the fields. The farmers are recommended to grow it as a manure for paddy and to use wood ash and phosphates to assist its growth; these are not lost but partly remain in the soil, partly pass into the plant which then thrives vigorously and takes up free nitrogen abundantly. Some 20 years ago the astragalus was mentioned as being of spontaneous growth and its cultivation was not alluded to; at present it is, in the south, an item of regular cultivation which costs nothing but a little seed, since it is broadcasted on the wet field before the paddy is cut and grows without attention thereafter.* Apparently

* This practice corresponds precisely with that so often urged for paddy land in Madras, viz., the broadcasting of a few measures of a leguminous crop, especially horse gram, over the paddy fields before harvest, to be cut as food for the cattle in the hot weather and thus provide stronger animals and better manure, or to be removed to the compost heap, or to be eaten down *in situ*, or to be turned under as green manure; the nodular roots and cattle droppings would enrich the land on which it grew, so that the field is in every way bettered by the crop. There is *no* excuse for neglecting this practice, but at present few places utilise this excellent method of fertilising the soil except the Kistna District where about one-third of the paddy land is sown with sunn hemp in this very fashion, chiefly for fodder. The horse gram, besides being a legume which appropriates free nitrogen direct from the atmosphere, is of the easiest possible growth on any soil and will flourish with a minimum of water. The practice is occasionally to be seen in the Tanjore district, where such crop is known as "vayal-payaru" (wet land crop); this, however, is not cut green but is allowed to ripen and is then pulled up in the usual way; it is therefore not used as a green manure and is only mentioned here to show, *à fortiori*, the possibility of growing a crop to be cut green.

—from its name and description—it is the same green crop which, with clover, is a great resource of the Chinese farmer who cultivates and uses it precisely in the same way; with him it is an essential as he has not the forest or waste-land resources for vegetable matter that the Japanese peasant possesses.

113. *Stable Manure.*—This is mentioned to show partly its comparative paucity, partly the care taken to save what there is. Since there were only 1,286,116 cattle of all kinds and ages and 1,514,745 horses in Japan in 1903, while sheep, goats, and swine altogether only numbered 277,264, it is obvious that stable manure plays a very secondary part. The value is recorded, however, as about £2,400,000 or 17*s.* per head of cattle and horses, a considerable item in the gross manure values. As regards horses it is said that the stalls are regularly boarded with a slope towards a grating under which is a large stoneware or wooden vessel for the receipt of the urine; this is constantly cleaned out and its contents poured over the solid manure which is composed of the droppings together with the litter which is only strewed at night; every atom of the manure is thus saved. The food being good, so also is the manure. Cattle are all provided with proper stalls in the same way as horses; cows are all stall fed and seldom stir out of the stall and cattle yard, while draught cattle return to the yard as soon as their work is over. The floor of the stalls is of rammed clay, and the cattle stand on the accumulated litter and dung as in the box system frequently advocated for Madras; fresh litter is put daily but the mass is not removed till the stall is inconveniently full, or till the manure is required; in this way every particle of the manure is collected and utilised. The cattle are carefully tended and are said to be washed daily; certainly those personally noticed were as clean as their yards and stalls. The carelessness shown in India about the chief manure available—and about its producers—would not be tolerated for a day by the poorest of Japanese farmers. The methods and carefulness of the Japanese are paralleled by those of the Flemish farmers.

The dung of the 11 million or more of fowls is, of course, carefully collected and used as a powerful addition to compost; an addition by no means inconsiderable since fowls will produce in a year from 13 to 16 times their own weight of fresh dung containing a large amount of N and P_2O_5. For example, 60 large English fowls will produce ordinarily 1 ton of *dry* dung per annum containing 90 lb. (4 units) of N worth Rs. 36, besides P_2O_5 and K worth Rs. 5 and Rs. 4 respectively.

114. *Seaweed.*—This is abundant on the long lines of the Japanese seacoasts and is largely used as manure by all farmers within a short distance of the coast; I have frequently seen it

gathered in to stacks or in process of removal to the fields on hand-carts. According to analysis it contains when fresh about 1·9 per cent. of N and 0·4 per cent. of PA ; it also helps to improve the physical condition of the soil. Obviously it is not of such value as to bear the cost of haulage very far from the shore.

115. *Rice bran.*—This is used but, from its nature, not to any great extent ; it is only mentioned here to show its value. The bran in question is not the husk, but the integument or skin between the husk and the starchy kernel; this is pounded off in wooden mortars in the operation of whitening the rice, and its loss not only renders the fine table rice insipid, but removes much of its food value. Analysis shows that in Japan 100 parts of air-dry material contain 2·08 parts N and 3·78 of phosphoric acid ; in America 1·9 and 2·7. In Japan there are few cattle to eat this food which is consequently used, when obtainable, as manure.

FORESTS.

116. * One of the most remarkable and agriculturally important features of Japan is its forests which cover more than 59 per cent. of the whole area of the empire ; from time immemorial stringent rules have been framed, and to some extent enforced, especially in the last three centuries, by the local barons and princes for the preservation of the woods and forests, the protection of the head-waters of rivers, the hindering of landslips and avalanches, the production of timber and firewood, and the conservation of valuable trees, being especially aimed at ; records were duly kept and rotation systems adopted though apparently there was a good deal of negligence in conservation. There was also a period of reckless felling in the disturbed period between the Shogunate and the full establishment of Imperial power, and even the prudent Japanese could not refrain from the entire denudation of woods near valuable markets as I have personally seen ; this, however, was stopped in a few years and a regular Forest polity and Forest department have been established. Most of the forests are of course on the hills and mountains, not in the fertile valleys which are given over to arable cultivation, but, as will be presently seen, there is a great deal of wood growth included as " forests " which is scattered in small blocks (*paullum sylvæ*) among the upland cultivation, and which should rather be called topes or groves, copses, spinneys, or plantations.

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* It is, of course, not intended here to describe Japanese forests and forestry, but only so much as directly affects the cultivator and affords lessons for Madras specially as regards private woodlands.

117. The total area of forests, excluding 4·2 million acres of "wild" land, is 52·4 million acres of which 2·2 million are "reserved" and 50·2 million are "utilization" forests. The gross area is divided into State, Crown and Private forests of 30·4, 3·5, and 18·5 million acres, respectively. While the State and Crown forests are of great general importance to agriculture, only private forests can be dealt with, and but briefly, in this note, for it is from these private forests chiefly that the cultivators draw large stores of herbage and vegetable matter as green manure for their fields, wood for implements, and fuel and timber and firewood for sale; while eleven-thirteenths of the State forests are in thinly populated Hokkaido and in the Northern Provinces of the main island, the private forests are scattered fairly evenly over the country according to the population, and over the several villages.

118. The nature of these private "forests" may be judged from the fact that while aggregating 18·5 million acres they are held in just 21 million plots, so that each "forest" averages 0·88 acre; some are larger, some smaller; hence, as stated above, they are rather the wooded plots attached to the various holdings, though often distant and probably forming continuous woods in many cases. Travelling by railway or by road in the more undulating and hilly tracts these woods and groves may be everywhere seen, sometimes as young plantations just set out, sometimes as grown woods, sometimes just felled, sometimes mere scrub-jungle.

119. Of the 18·5 million acres of "private" or rather "people's" forests, just 76 per cent., or 14 million acres,* belong to private persons, the remainder, except 2 per cent., belonging to the communes which in Japan, as in Continental Europe, are political Corporations, self-governing, and possessing property. Agriculture is perhaps equally benefited by both classes of forest, for while the strictly private forests benefit the individual agriculturist, the communal woods benefit them as a community and are probably managed with more foresight than the private ones. Apart from the manurial and other domestic benefits these people's woodlands give an immense profit to the owners; in 1905 the enormous quantity of above 203 million cubic feet of timber and above 16 million stacks (3′ × 6′ × 6′) or cords of firewood (each cord weighing 1½ tons if dry and 1¾ green) valued at about 43·5 and 35·8 million rupees respectively, were cut from these *private* lands, or more than five times the amount of timber and fifteen times the amount of firewood felled in the much

* 85 per cent. or 15·7 million acres is elsewhere stated as the area belonging to private individuals.

larger State and Crown forests; the yield per acre is thus 11 c.f. of timber and 1·2 tons of firewood. Besides this, 4·7 million bundles (each of a size to be tied with a 3-foot cord) of bamboos were cut, valued at 2·3 million rupees. Whether this means overfelling or not is not stated, but it was said in 1904 that with few exceptions private forests are left to nature and that they are in a very impoverished condition having been managed without sound principles, and that even since the Restoration (1867) there has been reckless felling of woods owned by private persons; the recent demand is so great for building, fuel, paper pulp, matches, etc., that such felling is to be anticipated; many areas, it is said, have little timber growth and only yield vegetation for manure; on the other hand it is elsewhere stated that private forests in *some* places are worked as a business with great care and yield large profits. But there is both ocular evidence and that of the statistical records to show that there is also *much* replanting; personal observation showed thousands of acres of young plantations near and in villages, and the latest (1905–06) annual report for Agriculture shows that 317 million seedlings and young trees were planted in 1905 on 260,000 acres of people's land, and it is on official record that in two recent years above a million acres of *communal* land alone were replanted with 801 million seedlings and young trees. Since it must be difficult to enumerate all petty private planting, these statistics of replanting are minima; they are none the less striking. The trees planted are mostly conifers such as the well known Cryptomeria japonica (162·5 millions) and others, but more valuable trees were also largely planted such as the camphor (1·34 millions), the chestnut (1·38 millions); the figures are for 1905 alone. This planting represents the trees grown on the woodlands only, and not the mulberry, lacquer, and vegetable wax trees, etc., grown on the arable fields or their borders.

120. The sketch attached to paragraph 16 *supra* gives some idea of the intermingling of these woodland blocks with the upland cultivation; often they are plots too steep or rocky, etc., to be terraced, or else are deliberately maintained as woods; sometimes they are wild scrub, sometimes carefully planted topes of varieties of pine, etc. In "Japan in the 20th Century" it is stated that they are largely regarded as places for getting "fuel and fertilisers in the shape of grasses and herbage so that even at present there is no small number of woodlands *containing no growing stock* and principally used by the people for procuring manure grasses and herbage from." Another writer (Dr. Nagai) speaks of the large number of "*prairies naturelles*" the produce of which is used by the ryot in preparing his compost. To judge

by their valuation for assessment they do not *naturally* contain much timber of value; the total capital valuation for assessment of the 18·5 million acres was only Rs. 362 lakhs or Rs. 2 per acre; in 1904–05 the 32,500 acres of State forest sold for cultivation, were valued at about Rs. 4 per acre. The assessment *plus* local rates on the whole 18·5 million acres in 1906 was only Rs. 33·3 lakhs or about 3 annas per acre, and this was at war rates; the original or normal rate would be little above one anna, State assessment alone being perhaps 9 pies per acre. These local woodlands, held by each little farmer in petty areas close to his house or farm and at nominal rates are of great advantage to him; taking the land individually held at 14 million acres, there is about 1·1 acre of "woodland" for every acre of arable holding; taking communal and individual together, there are nearly 1·5 acres of wood per acre of arable, the whole of which is held within the villages themselves.* Whatever the

* In this Presidency the only counterparts to the Japanese village woodlands are the petty village reserves supervised and annually rented out by the Forest Department, a variety of puramboke not so supervised and mostly bare, such as village sites, cattle-stands, etc., and the village assessed waste which being liable to absorption into arable is simply cleared of every blade and stick that can be taken off it; in large tracts, moreover, there is practically no waste at all, as in many parts of Coimbatore, black soil tracts, etc On the other hand, the holdings of the ryots in this Presidency are larger than in Japan and one-fifth of the ryots' holdings—less in the Tamil districts, more in the Telugu districts except Bellary, Kurnool and Ganjám—are annually left fallow: both nature and good culture *demand* that a portion of these lands shall be planted with trees of agricultural, industrial, and dietetic value. It is the lower class of land which would be most benefited by trees either as a rotation crop or as a permanency, and these are the low-assessed areas; there are several millions of acres in holding assessed at rates not exceeding 8 annas, and much of it at half that rate. It is impossible to believe that this assessment really stands in the way of tree planting; one acre at 6 annas will cost the ryot for assessment less than Rs. 4 spread over 10 years, and while the field itself will be vastly improved in texture, nitrogen contents, etc., by the action of the trees, the value of the timber, firewood and incidental advantages will far outweigh any such cost, and its annual produce in manurial or fodder leaves, etc., will so benefit the remaining lands that the reduced arable area will produce larger and, what is even more important, more regular crops, better able, through the improved texture of the land, to withstand seasonal stress; the mere cattle manure saved as fuel by such plantations will more than repay the cost of planting.

If it be desired, however, to encourage tree planting, it is open to Government to enlarge the tope cowle rules (S.O. 19) by allowing land in holding or that may be taken up from existing waste irrespective of the period during which it has been waste, to be cultivated with trees at a nominal or *nil* assessment for 10 years or for 5 years when the "trees" are only manurial shrubs. Last year Government relinquished the village service cess of 26 lakhs, which represented (part of) the amount immemorially paid by ryots for village services rendered, a gift for which the general tax-payer must now pay instead of the ryot who gets the services. Had this sum been retained, it would have been easy to grant the above privilege or to insist on ryots cultivating a portion of their holdings with trees on condition of receiving a rebate of assessment; 26 lakhs represents the

past history of these woodlands the present owners seem to be waking up to their value as shown above in the replanting statistics; replanting is in its infancy but the statistical results are already somewhat startling, and the most superficial observation shows large areas of new plantations, principally of the various conifers; the statistics also show many more valuable trees such as 1·4 million camphor trees in 1905 alone on private woodlands.

121. This replanting of woodlands is a marked feature of Japanese petty forestry (it is also largely carried out in the State forests) and is largely due to the foresight of the authorities. So far back as 1876 Government attempted to induce private persons to replant State forests in areas where there had been reckless deforestation, by offering a percentage of the profits; this plan succeeded but poorly, though about 200,000 acres have

assessment annually on 5·2 million acres at 8 annas per acre. Or the amount of this cess might have been annually remitted to each village on condition of a proportionate amount of tree planting. The Japanese, notwithstanding heavy and heavier taxation, do not remit taxation so much as spend wisely with the certainty that much greater benefits will accrue than had they remitted a few annas per head; their heavy expenditure on Fisheries, on Agriculture, and on Industries is only possible because they tax in order to spend heavily in directions in which State help or initiative is necessary. The authorities might also establish nurseries at various large weekly markets- which in Coimbatore used to, and probably still do, yield a rental income more than sufficient for actual market needs—for the gratuitous distribution of seedlings of good quality, as in the Japanese Agricultural Stations; see footnote to paragraph 121 *infra*. This would, *experto crede*, immensely popularise and stimulate fruit tree planting. A fiscal stimulus to tree planting would be the promise, coupled with an entry of the promise in the pattah, that, up to a certain area or proportion of the holding land planted with trees should, in no case, be liable to enhanced assessment at the next subsequent Settlement. A very great increase in tree growth is *not* a mere individual question; it is national or State; increased rainfall and climatic amelioration, the supply of timber, fuel, fruit, fodder, leaves, the consequent diversion of manure to its proper use in the soil, the positive increase and betterment of the manure itself through the produce of the trees, the improvement of the surface from the sub-soil chemically and physically, the consequent increase in crop and diminution of liability to damage through drought, improvement of the soil of the planted field, the provision of a crop in timber, etc. which is not liable to destruction by drought; these and other advantages which mean greater agricultural stability and decrease of liability to seasonal stress, are national necessities.

As regards the ryots the very trees that would most benefit the land are those which grow most easily or even spontaneously, viz., the Leguminosae, such as the Acacias and Albizzias, or shrubs such as the Tephrosia purpurea so greatly in demand for green manure. In many places little besides protective *enclosure* suffices, with a rough ploughing and dropping of the seeds or, as in Tinnevelly by feeding goats on the land with the pods of the trees desired; in Japan the method of nurseries is found the most successful and any ryot could raise in his backyard a nursery sufficient for an acre, absolutely without cost, of any desired tree. The subject will be developed in "Suggestions" in a second edition of this Note.

thus been replanted. But when, under the laws for self-government, the communes were compelled to raise and expend funds, it began to be seen that the planting up of the communal waste lands with trees was likely to be very profitable, and thus increase the communal income outside of taxation.* The recent Forest law provides for grants-in-aid of planting but it would seem that technical advice was given rather than cash; the result however of communal action is mentioned above. Apparently the system of nurseries† is adopted as in the State forests, and owing partly to climate, skill, and class of tree raised, the saplings are often not transplanted till they are 2 or 3 years old.

122. Statistics are not available to show the ownership of the 14 or 15 million acres of individual private forest, but in fact most belong to farmers, and are largely utilised for supplies of green manure; to some extent at least, they are cultivated and planted at considerable expense; they also pay the land tax assessed, like arable land, on their capital value which however is apparently rated very low so that the land tax is low. The State while handing over to the farmers both the arable and the woodlands which they occupied, demands its assessment on each class of land, and where State forests are judged unsuitable (from small size, etc.), for State management or are useful only for manurial herbage, they are sold and assessed. Wood in Japan is regarded as a class of cultivation, and the farmer regularly grows wood, sometimes, as personal observation shows, in a quasi-rotation, but generally as a necessary supplement to arable cultivation and as an addition to his income; Captain Dyer, quoted

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* Compare that Swedish town Orsa where there is no taxation and everything is *free*, schools, trams, lighting, &c., the income from the well conserved communal forests furnishing the necessary funds, and doing so not by wasteful felling but by rigid maintenance and conservation, so that the forests are increasing in value.

† In 1879–81 the writer carried out a system of nurseries in the Erode division from the old Jungle Conservancy Fund; nurseries of useful trees (tamarinds, &c.), were formed at various centres, especially weekly market sites; the young seedlings were transplanted into pots tall enough to allow the tap root free play, and ryots coming to the market were supplied gratis with a few plants which they took away in their carts; many thousands were thus distributed, it being found that a ryot—according to the Tamil maxim to treat seedlings like children—will carefully nurture a young seedling though he may not take the trouble to grow it from seed. The plan was perforce abandoned when the Forest Department took over the Jungle Conservancy Fund. For the encouragement of fruit and other trees, the growth of which is essential if diet is to be improved, cattle dung abolished as fuel, restorative leaf manure given to the fields, the regular forests supplemented, domestic needs supplied, and cash provided which will pay the arable field assessment almost irrespective of season, some such plan should be adopted, planting-baskets instead of pots being used; few operations could so benefit the ryot as liberal and liberally aided State-encouraged tree planting.

in an Appendix to Alcock's "Capital of the Tycoon," expressly mentions the planting of trees as a rotation crop, and Kinch in the "Asiatic Transactions" says that many parcels of land are thus fallowed, that is, temporarily relieved from arable cultivation and placed under wood. The above remarks relate to woodlands proper and not to orchards and fruit trees which, of course, the Japanese farmer treats as a regular and valuable crop, a crop and source of income so sadly neglected in the Madras Presidency where a single tamarind tree occupying and utilizing only a corner of a field or even a backyard, would often pay the full assessment of the ryot's whole holding besides being largely independent of season and a valuable asset of capital.

123. In Japan the statistical reports on the silk mulberry, tea, etc., expressly take note of the area planted not in regular fields but as borders to the other fields, in house-gardens, etc., as indeed may be seen by any observer; these border plantations amounted in 1904 to the astonishing amount of 189,465 and 49,905 acres respectively, or 24 per cent. and 40 per cent. of the whole area of silk mulberry and tea. So Dr. Nagai speaks of the valuable paper mulberry as "chiefly grown" on the borders of the various fields, and the vegetable wax and lacquer trees are also so grown. These are instances of the Japanese passion (a necessary one no doubt) for utilizing waste space and in a most lucrative fashion.*

124. The replanting of private woodlands by Japanese peasants, and its stimulation by Government have been alluded to; the following are some of the provisions of the Forest law relating to conservation of forests, and it will be seen that the Japanese Government is prepared to, and doubtless often does, exercise a controlling power over such forests of whatever description; it will be remembered that all "private" forests are of a minute description, though occasionally forming large blocks by contiguity. Moreover the provision in sections 3 to 5 makes no mention of public interests or contingent questions but only of the ruin to the forest itself, whereas section 7 and all subsequent

* There is probably no Revenue Officer who could not suggest similar utilization of waste in his sphere of work; a road bordering paddy fields or irrigation waters, drainage or otherwise, which will bear an avenue of cocoanuts and pay the road upkeep (*experto crede*) several times over; damp corners where splendid trees will grow but which now produce only mosquitos; backyards which would be not merely wholesome but hygienic and productive if planted with trees and flowering shrubs (a Tanjore Brahmin ryot told me of a tamarind tree in his backyard which for generations had produced up to Rs. 40 per annum); borders of fields which will grow fruitful or manurial trees or protective hedges and will thereby be demarcated for ever without fear of cavil or dispute. The tree, using the word in its widest sense, is one of the main hopes of Madras cultivation.

sections expressly relate to public interests, viz., to those forests whether private or State known as "Hoanrin," or forests of which the preservation is necessary on public grounds such as to prevent landslips, avalanches, sand-drifts, and to protect sources of water, fisheries, scenery, etc., etc. Private Hoanrin amount to only 1·15 million acres in 185,546 lots, or 6 acres apiece.

"*Section* 3.—When a private forest is likely to be ruined by mismanagement, the Minister (Agriculture) may order a proper system of conservation.

Section 4.—When felling is carried on in disregard of such order, the Minister may forbid such felling and may order the owner to plant trees in the area felled.

Section 5.—In case the order mentioned in section 4 is not carried out, the authorities may carry out such planting and recover the expense from the owner, or may confiscate the land."

The subsequent sections relate only to the Hoanrin and are of a drastic character, such woodlands being practically treated as "reserved forests," insomuch that even the feeding of cattle, the removal of earth, grass, etc., are forbidden without express sanction. In such cases the owners pay no taxes and may claim compensation for any direct loss caused by the prohibition of felling.

125. These woodlands, then, play an important part in the rural and agricultural economy of Japan, and from the action both of Government, of communal bodies, and of private persons, that part is likely to increase in agricultural and industrial importance. The instruction of the people in the general value of woodlands and in the best methods of conserving and developing them, is carefully provided for by the State; see paragraph 148 *infra*.

THE NEW SYSTEM.

126. In the preceding pages a sketch has been given of some items in the condition and practice of the Japanese farmer; except as regards his revenue relations with the State, the importation and use of some amounts of fertilisers, and a slight increase in the use of cattle and their products, the conditions and methods of farming were, till recently, as they have been for centuries. But the Japanese Government with the insight of good administrators and the foresight and larger vision of true statesmen, saw that new methods were needed to cope with the new conditions of population, trade and industry, and the entry of the country into relations with the outer world; methods and practices suitable for a stationary population and a self-contained country do not suffice for a progressive nation where

continuous and rapid advances are essential if intelligent productivity is to keep pace with competitors. The methods adopted show that, as usual with these alert statesmen, they searched the world for the most fruitful ideas on the development both of farming and of the farmer; America and Germany, as might be expected, seem to have supplied most of the new ideas both as regards education, State assistance, and organisation. A brief sketch will now be given of facts and results on these lines.

127. *Methods adopted.*—As in the case of fisheries (see Note on Fisheries in Japan) Government have directly fostered agriculture not in one but in many ways; by the establishment of a comprehensive and expert Agricultural Department under a Minister for Agriculture and Commerce which studies the agriculture and agricultural systems of the world and applies the results to Japan through its various agencies; by wide and continuous enquiry and experiment in Experimental Stations scattered over the country; by the educational examples and teaching provided in the farms, gardens, libraries, etc., of these stations for the adult peasant; by education, through the nexus of agricultural schools which cover the country and through the lectures and teachings liberally provided in the villages; by the chain of Agricultural Associations of every grade, from the Prefecture to the village, for finance, education or mutual assistance and support; by the support given to financial institutions such as Banks, credit associations, etc.; by direct financial aid; and by various legislative and executive stimuli. The above aids to agriculture and the agriculturist are not mere suggestions or visions of the future but every one is in active operation and visible to any one who will visit Japan; the work has been going on for more than 20 years and its effects are becoming obvious, and if in direct financial aid to the *small* peasant through Mortgage banks, efforts have not been highly successful, Japan shares the difficulty with other countries, and notably with the mortgage banks of Germany, its prototype in such measures. The stimuli mentioned above will now be discussed *seriatim*.

The Department and Cost of Agriculture.

128. The Department of Agriculture is under the Minister for Agriculture and Commerce who also controls the Fishery Department. The precise strength of the Department has not been ascertained,* nor would the statistics be of much value unless it

* Owing to the demands on my time in the matter of Fisheries when in Japan various items in Agriculture were very imperfectly examined; it is hoped to remedy the defect this year and to present a revised edition of this Note.

were possible to include the expert staff of the numerous Experimental Stations, schools, etc., under the Department. As in the case of Fisheries, the best mode of gauging the strength of a Department is through the work which it is doing or promoting, although in the work of stimulation honours are shared with the Educational Department which controls the great bulk of the schools. The cost of "Agriculture" cannot be ascertained from the Financial Reports printed in English since Commerce and Fisheries are also included in the lump sums stated; moreover the Imperial or Departmental expenditure (including the Imperial expenditure on Agricultural education) is moderate compared with that from Prefectural funds. For 1906 these latter (District funds) budgeted Rs. 27·7 lakhs for "Agriculture" alone, viz., on ordinary Agriculture (14·88), silk (7·8), tea (0·24), and stock breeding (4·78); for shows, which are at least partly agricultural, an additional Rs. 1·5 lakhs are also budgeted. The expenditure of Rs. 14·88 lakhs on ordinary agriculture comprised Rs. 6,55,581 for Experimental Stations, Rs. 31,837 for farm schools, Rs. 32,608 for itinerating teachers, Rs. 3,45,528 for Agricultural associations, and Rs. 4,22,698 for experiments conducted by experienced farmers at the wish of the Department, for the distribution of seeds, plants, eggs, poultry and stock, for irrigation grants-in-aid (irrigation works are maintained and repaired by the farmers), field consolidation (Verkoppelung), and other encouragements to agriculture. Expenditure has steadily increased from (before) 1897 when the outlay on the above items was only Rs. 4·8 lakhs; even the war made no difference on the outlay, the expenditure in 1904 and 1905 having been slightly over 24 and 25 lakhs respectively, and these again were considerably larger than the expenditure in 1902 and 1903; this is in accordance with the officially expressed determination of the Government to allow no decrease in important civil expenditure by reason of the war.* To this Prefectural expenditure must be added not only that on agricultural education but also the Imperial outlay, viz., the unknown cost of the Department proper and the amounts bestowed on the Prefectures as grants-in-aid (unless these are included in the sums locally expended); the Imperial budget for 1906 showed grants of Rs. 2·22 lakhs for Agricultural associations, Rs. 2·12 for

* "Undertakings which are of the highest importance to the economic progress and expansion of the nation are not to be neglected for a moment even in time of war" (Fifth Financial Report). The promotion of agriculture, fisheries, manufactures, etc., were conspicuously "of the highest importance" even in the eyes of a State which was in a life and death grapple, and of which the financial, and fiscal resources were being strained to the uttermost, and no retrenchment in expenditure was allowed.

Prefectural Experimental Stations and "farm schools" attached to them, and Rs. 5·46 lakhs for the general improvement of agriculture; agricultural education received grants-in-aid, and the cost of the Agricultural Colleges and of the Central Experimental Stations must be added. Imperial and Local expenditure together, it is certain that the gross expenditure must be well over Rs. 80 lakhs per annum on agriculture and agricultural education, and this does not include large items such as forestry. The figures supply their own commentary.

Education.

129. *General.**—A restricted form of education (humanities) has been traditional in Japanese history, but modern education dates only from the Restoration of 1867, since which it has developed with a rapidity as startling as any other phenomenon of the national progress, beginning with a University in 1869, a regular Educational Department in 1871, and a regular Educational System in 1872, gradually modified till it is now in line with that of the most advanced countries. It cannot be doubted, but that this development of general education has been at the root of much of the national progress, and both has affected, and will in the near future most powerfully affect, the progress both of the technique of agriculture and of the agriculturist. With general education this Note cannot deal, further than to point out that 93·23 per cent. of children of school-going age are under instruction in Japan. The leap at education which the whole nation has made under the compulsory system is shown by the fact that while the primary school system was only formulated in 1872, by 1873 the number at these schools had already reached 28 per cent., by 1883, 51, by 1893, 59, and in 1904, 93 per cent. of children of a school-going age; in 1883 only 40 per cent. of the girls as against 74 per cent. of the boys were at school, but in 1904 the percentage of girls was 89·58, and 96·59 of boys. The school age extends by law for 8 years, viz., from 6 to 14, and attendance is obligatory; 4 years is the ordinary course of a lower elementary, and from 2 to 4 that of the higher elementary school; all these schools are well equipped for instruction.

In 1904 there were, according to the 31st Annual Report, 27,138 elementary schools with 108,360 teachers and 5,084,099 pupils; 987,377 pupils completed their course of instruction in the year. For the training of the teachers there were 61 normal

* This paragraph was written in England before having seen Mr. Sharp's Report of 1906 on Education in Japan; to that work reference should be made for full details on general education.

schools with 1,069 instructors, and 19,466 persons under instruction as teachers, either in the full or in the simpler courses, 4,041 being women; the full course is of four years for men, and three for women; in the year 4,794 graduated from the schools as teachers after the full course, and 3,749 after the simpler course.

130. *Science and Agriculture in Primary Schools.*—Now, in the higher elementary schools where the pupils are above 10 years of age, science is taught as an item of the regular course; just simple lessons on plants, animals, minerals, so arranged as to bear on agriculture, aquatic production, local industries, etc. But in these schools agriculture may be an additional subject, and in no less than 1,533 such schools is that subject taught as part of the regular course, and in 28 as an extra. The teaching is to have special reference to local conditions, be practical as far as possible, and deal with soils, manures, irrigation, planting, and so forth. Special teachers who have been trained in the normal schools are employed for such instruction, and here it should be noted that *all* teachers—"the brain of education"—taught in the 61 district normal schools are instructed, *inter alia*, in natural science and agriculture; in these normal schools natural science is to be so taught that exact knowledge shall be given, and the "general principles governing the relations of plants and animals to one another and to man shall be clearly set forth"; while in agriculture the topics to be treated include soils, manures, cultivation, planting, breeding, the outlines of rural economy, etc.; practical training shall be given in such topics as specially suit the locality, and some notion of forestry and aquatic production; the teaching occupies several hours of every week in all four years of the course. This instruction is perhaps the easier and more useful since the elementary school teachers are largely drawn from the class of agriculturists; out of 4,891 enrolled in the regular courses of the district normal schools in 1903–1904, 3,152 or two out of three were sons or brothers of farmers. Hence it is clear that a large number of boys annually receive in the primary schools a valuable grounding in elementary natural science and agriculture.

131. *Supplementary Schools.*—This is but the beginning; following the higher elementary are the so-called supplementary (continuation) schools, a class founded by a law of 1893 revised in 1902, and expressly designed to give "children engaged or intending to engage in practical pursuits such general knowledge and skill as are necessary for such pursuits and to supplement the work of the elementary schools"; industrial and trade subjects are their chief aim, and the seasons, hours, and subjects are chosen to suit the locality and industry. This kind of school or class is increasing with great rapidity especially of late; in 1905

there were 1,436 such schools for agriculture, the number of pupils being 62,918; and of graduates (boys who have completed their course) 10,762; the schools increased by 335 from the figures for 1903. The schools or classes are annexes to elementary and middle schools, and, perhaps generally, have only short sessions as in the winter months, or between cultivation seasons, or the tuition is given in the evenings or on holidays; hence the large number of pupils. In these schools the agricultural teaching of the elementary schools is amplified and carried to a further stage; subjects such as chemistry and physics, harmful insects and plant diseases, sylviculture, surveying, etc., are taught. At the College of Agriculture in Tokyo, forming part of the Tokyo University, there is a special branch for training the agricultural teachers for these supplementary schools; the agricultural course for such teachers lasts for one year, and candidates must be graduates of normal schools who have completed the special course of agriculture therein, or at least graduates of an A class agricultural school.

Many of these supplementary institutions develop into complete agricultural schools.

132. *Regular Agricultural Schools.*—The next grade comprises the regular agricultural schools totalling 118 (an increase from the previous year of 8) divided into classes A and B of higher and lower grade respectively. In 1905 these schools had 12,203 pupils with 887 teachers; 3,076 completed their course; there were 8,624 applicants for admission, of whom 6,211 were accepted.

133. B *Class Schools.*—The curriculum in B class schools embraces the usual subjects of general education ("morals" always), science, and agriculture (soils, manures, crops, agricultural manufactures, sericulture, etc.), and the course extends over 3 years with 27 hours of study, exclusive of plenty of practical work on the school farm, per week. Pupils must be over 12 years of age, and have completed at least the lower elementary school course. In 1905 the 52 schools of this class had 3,927 pupils and, presumably, about 1,000 completed the course. The graduates from these schools almost wholly go back to agricultural pursuits.

134. A *Class Schools.*—The A class are of the Middle School grade with a course of 3 years extensible to 4 years, and 30 hours of study per week, exclusive of practical work on the farm; there is in addition a preparatory course in general education for those who, though admitted, are by reason of age, etc., not sufficiently advanced to benefit by the technical course; a post-graduate course not exceeding 2 years is also permissible for

those desirous of studying special subjects, and a supplementary course of similar length for those who wish to enter advanced schools of agriculture; special short courses of a simple nature are also admissible. The curriculum is of course an advance on that of the B class, and includes the elements of forestry, veterinary medicine, etc., besides many optional extras; "morals" is, as in all Japan, an essential subject. Pupils must be over 14 years of age on admission, and have completed the full 4 years' course of the *higher* elementary schools; those entering the preparatory course may be 2 years younger, but must have passed 2 years in the higher elementary school. In 1905 there were 9,732 pupils and over 2,000 graduates passed; the majority of graduates, it is said, go back to agriculture or work connected with agriculture, or enter public service usually in the agricultural line whether as teachers or in connection with Agricultural Associations, or go on to higher agricultural schools. *E.g.*, from a small school of 89 students established in 1899, 98 students had passed up to 1904; of these 39 had gone back to agriculture proper, 19 had become teachers or agricultural officials, 14 had become primary school teachers (after an additional course of agriculture in the Normal School), 7 had entered higher agricultural schools, 5 had gone to America, and 8 to the war. These schools serve also for the dissemination of knowledge and ideas to others than the pupils, for during vacations the teachers go on tour to make agricultural investigations, to hold conferences with agriculturists, and to give lectures and informal talks; the school also serves as a centre for distribution of seed, silkworms' eggs, etc., of special quality for experiment by the farmers. The teachers are men of good qualifications, the principal instructors being often men trained in the Tokyo Agricultural College, and well versed in practical farming; expert farmers are also employed to superintend the practical work of the boys.

135. *Support of Schools*.—All the agricultural schools hitherto described are of local origin and support, being started and maintained either by the prefectural, town, or village government; the Imperial Government merely gives a grant-in-aid; the expenses are borne by the locality which utilizes the school, and not by the general tax-payer through the medium of the central government. The nature of the two classes A and B may be better understood by a brief description of a personally visited school of each class.

136. The B school, selected purely by chance, was situated in a large village many miles from a town, and was started 4 years ago by the people (school association) of the 9 surrounding villages, stimulated no doubt by the district or county

authorities.* The pupils are drawn from these 9 and one other village, some of them walking daily 5 miles each way; they must have passed six years at a primary school (4 years in the lower and 2 in the upper) and are 12 to 14 years old at entrance. There were 115 on the rolls belonging to the several years of the 3 years' course, and notwithstanding the war, the attendance is increasing, 45 having been enrolled this last year in which 30 graduated from the school; fees are paid, viz., 10 annas each per month. All the pupils are sons of petty local farmers, and the 30 graduates have all gone back to work on their farms; this is known because touch is kept with them, as they live in the neighbourhood. Moreover, since by law, the local farmers are members of the village Agricultural Association, lectures are given and conferences held by the school teachers at the Association during the winter when there is no field work; the farmers also frequently bring their difficulties to the school for solution.

The curriculum is as given above; there are plenty of good text-books in agricultural subjects, from which the boys are taught the proper methods of irrigation and use of water, the management and value of manures, etc.; sericulture is specially taught, silk being largely produced in the locality; bee keeping is being newly attempted. Forestry is taught to all as a branch of agriculture; not so much the technique of forest management, but that knowledge of arboriculture and sylviculture necessary to the small farmer.

137. The buildings are unpretentious; just simple class rooms, a library of 539 volumes, laboratory and museum, silkworm sheds, and the necessary outhouses. Practical work is well

* In Japan the Prefect corresponds to some extent with the Collector, and his prefecture (ken), with about a million people, to a district; the district is divided into counties which correspond with taluks, and the officers are related to the Prefect somewhat as our Tahsildars are to the Collector. But the Prefect is more of a Governor and is frequently called so; he administers a district largely on his own initiative, frames a budget of taxation and expenditure, not for a few local purposes as in our District Boards, but for the general administration for which he is responsible; the Imperial Government merely provides a general supervision and gives grants-in-aid. The powers and duties of a Prefect correspond rather, though in miniature, with those of the Lieutenant Governors of Indian Provinces. To some extent this authority is delegated to the various local units such as counties, cities, towns and communes, the last three of which are civic self-governing corporations owning property and levying and expending local taxation. The commune or village, whether of Europe, Japan or India itself, deserves deep study in India; a reform which restores the Indian village to a self-contained and responsible unit of government, its ancient status being merely modified to suit modern conditions, is greatly to be desired, as it contains the germs of concerted and co-operative action whether in agriculture, credit, or industry, in self-government, and in political representation.

provided for; about half a mile distant is a 5-acre farm of wet and dry land, cultivated by the boys with the aid of an old peasant farmer who seems to do some of the heavier work of manuring; tools of suitable size for the boys are neatly kept in a store room. Manures and their use are very carefully taught both for wet and dry land, including of course the use of human excreta and of green manures, of which astragalus is regularly grown for the purpose. The proper use of artificials is also taught, as these are being introduced through the Associations. The gross income last year was over Rs. 4,600, of which fees provided 792, the Imperial Treasury 900, the Prefectural Treasury 750, and the villages 2,200; although it was the year of the Russian war, the contributions neither of Government, District, nor Villages were slackened. The expenditure, mostly of course on salaries, was also about Rs. 4,600; it is noteworthy that the managing council received as fees only an aggregate of Rs. 27 for the whole year (as in previous years), presumably as travelling batta; so also the doctor. The gross population of the nine villages which maintained the school was 36,513, holding 33,900 acres valued at Rs. 17·4 lakhs or about Rs. 51 per acre; hence the school rate (Rs 2,200) would be nearly 1 anna per acre and per head. The cost includes a small fishery branch which had only three boys and was an obvious failure. The wet land is rented by the school at Rs. 48 per annum per acre, wet land being valuable in the locality; the boys also obtain object lessons from surrounding practice. Two or three miles away is a considerable wood which forms part of the school endowment and where the boys learn sylviculture.

The masters are paid Rs. 75 (Headmaster), 45, 45, 45, and 9 (arithmetic only) per mensem. The Headmaster and another are Normal School men, who have also received the special one year course in agriculture at the Tokyo College of Agriculture.

138. The A class school, situated in a village about 15 miles from the District head-quarters, is a much larger and really fine institution; the building is very large containing several blocks, and consists of ranges of class rooms, laboratories, a museum, library, etc.; large and convenient dormitories and day rooms and a very large hall for lectures and meetings. The school was first started in 1901 with 50 agricultural, 16 forestry, and 45 preliminary course students; the land first given was about 10 acres but apparently not in farming order, for the school staff had to lay out the ground at their own personal expense while the scholars performed the necessary labour. In 1903 the present handsome building was opened and in the next year 31 graduates went out in agriculture and 6 in forestry. There were at my

visit 230 pupils, of whom above half were boarders, who, however, supply themselves with food by cooks hired under the masters' supervision; the tuition fee is Rs. 1-8-0 per month for 11 months in the year. The teaching staff consists of 17 professors or teachers, and 3 clerks: both the Head and second masters are graduates of the Tokyo College of Agriculture, and both the second and another are practical experts The Headmaster is also chief superintendent of the Agricultural Experimental station a few miles distant (see below *s.v.* "Experimental stations") so that the two institutions work in together, and the lads trained at the school will readily visit and take their difficulties to the Experimental station, and be ready to carry out on their own farms the experiments, suggestions, and demonstrations of the station.

139. The regular course is of three years with a preliminary year of general education as the boys, usually of 13 or 14, are hardly educated enough to take the school course at once. The curriculum in agriculture and forestry is intermediate between the B class of school and the College of Agriculture. All the pupils are sons of farmers in the district, and most go back to farming life; some get service of an agricultural nature under Government in the various agricultural or quasi-agricultural services, some with the numerous Agricultural Associations, some as agricultural teachers; in general they keep touch with agriculture in one form or other.

140. A farm of 13 acres surrounds the school on which the boys, who are said to like out-door work better than the class room, were engaged during my visit; several afternoons per week and, when required, whole days are thus occupied. The necessary instruction was given by one of the masters who is not only a College graduate but a practical farmer, and by two peasant farmers. The farm has wet and dry fields with all kinds of crops in growth; on the paddy nurseries various experiments in manuring were in progress; on the dry land X was being used in preparing the furrows between ridges of barley for the planting of squashes and cabbages, and various composts were under preparation in the sheds; silk and tea crops were in progress, and there was a poultry yard and a very small stock yard; an excellent pomological garden contained many fruit trees for instruction in practical fruit culture, and there was a garden with ordinary and special trees for sylvicultural instruction since a forest had only just been acquired. This forest, where practical forestry is to be taught, lies on the hills some miles away, and is about 500 acres in area.

Sericulture is carefully taught since the district grows silk largely.

141. Practical work is thoroughly attended to; in the first year the farm work comprises the handling of implements, cultivation of common crops, stock breeding and management, prevention and cure of disease, preparation of manures, the growth and tending of shrubs, fruit trees, etc., etc. In the second year the making and repair of implements, cultivation of special crops, and subjects similar to those of the first year are taught; in the third year the same except that horticultural crops are those most attended to. During the three years agricultural manufactures are regularly taught, such as articles made of straw and mat grass (*Juncus effusus*, etc.) which are very important in Japan both for home use and export; in the third year the preparation and cure of tobacco and starch, brewing, indigo and tea manufacture, the making of preserves, etc., occupy the student's attention. In sericulture the work includes, of course, all the ordinary operations of cultivation, and, in addition, the microscopical and other examination of eggs for the detection of disease, the proper selection of cocoons, etc. In carrying on the work of the farm, book-keeping is rigidly insisted on, so that profit and loss may be properly noted and considered. Tours of inspection especially to other districts are also made, so that students may profit by the methods foreign to their own districts; experimental stations and other schools are also visited.

142. The cost last year was Rs. 31,200 defrayed from the prefectural treasury aided by a small Imperial grant-in-aid of Rs. 2,250; fees brought in about Rs. 3,750, and sale of produce Rs. 1,500 which will be increased when the forest is being worked. Nothing in this school, says my notebook, seems to be left undone to promote (1) good general education, including as in all Japanese schools, "morals," which inculcates truth, honour, duty to one's country, etc., (2) good technical instruction, and (3) practical field work. Hence we see here about 70 young men of the farmer class annually leaving the school for agriculture or agricultural assistance; they have been taught to think about and to think new thoughts about their processes, methods and work; they are the means of popularizing new and sound ideas; they are new thinkers and new disseminators. And this school is but one of many.

143. In the same district there is a county (Taluk) school of agriculture of the B class, established eight years ago, and turning out annually about 20 graduates most of whom go back to their farms; some have become officials of Agricultural Associations (it will be seen presently that there are many thousands of

these Associations in existence) but not of Government service. The school has a farm of 2½ acres, half owned half rented, worked by the boys under a couple of peasant farmers.*

144. *Higher Agricultural Education.*—The highest agricultural education is given in the Agricultural College of the Tokyo University, in the school at Sapporo (Hokkaido), and in the Morioka Higher School of Agriculture and Forestry for the North Eastern Provinces. On the latter two institutions little more need be said than that they are excellently organised for study and practical work in agriculture, stockbreeding, and forestry. The main course at Sapporo is one of four years for superior instruction in agriculture and forestry with a preparatory two years' course if necessary; there are apparently special three-year courses for agriculture and forestry separately, and a special practical course for those who require practice only; post-graduate two-year courses are also provided. The institution has nearly 15,000 acres of arable land, a large forest, a botanical garden of 9 acres, 200 head of cattle and horses, and a large museum. This school or college has turned out above 600 graduates who supply most of the technologists locally required. The island (Hokkaido, or Yeso) being poor, and the inhabitants backward, a certain proportion of the students are exempted from fees (ordinarily Rs. 30 per annum) and granted a small yearly stipend.

145. *The College of Agriculture.*—The College of Agriculture forms part of the Imperial University at Tokyo, and is a most perfectly organised institution situated in Komaba, a rural suburb of Tokyo. The curriculum and rules are fully entered in the University Calendar and need not be repeated here; suffice it to say that there are 4 separate and complete courses, viz., Agriculture, Agricultural Chemistry, Forestry, and Veterinary Medicine, of which the first two, to some extent, overlap; each is a three-year course, and is intended for students of superior education, who wish to become experts, teachers of agriculture, or officials in various agricultural and quasi-agricultural posts which are numerous in Japan. Besides the regular courses, there are subsidiary courses, also of three years, the pupils in which are from a

* The rental is paid in rice after the old fashion, and amounts, it was said, to 14 bushels per acre for dry, and 24 for wet land; including taxes or rates the charge for the wet land is said to be 40 bushels per acre, (2 koku of 5 bushels each per tan, which equals ¼ acre). The land in this part is very fertile and high rents are therefore the rule; this represents an outturn of 50 or more bushels per acre. The "rice" mentioned here and in all other statistics in this Note is husked rice (genmai) as found in commerce; that is, rice stripped of its husk but without the final polishing which fits it for the table; 50 bushels of "rice" (genmai) are equal to 100 bushels of paddy, as in Madras. This yield is above anything known as single crop rice in this Presidency.

lower educational grade, viz., from the Middle School, and must be the sons or brothers of actual farmers, cultivating 12 or more acres; these men are trained as practical farmers and the course is arranged on that basis; it is a farming course, *plus* an agricultural education, and they are expected to work every afternoon on the farm and throughout the cultivation seasons, the mornings being ordinarily given up to the class room and laboratory.

There are 23 Professorial Chairs, and the Calendar contains the names of 18 Professors, 21 Assistant Professors, 10 Lecturers, and 5 Lecturers and Instructors in the subsidiary courses.

146. The extensive buildings include besides the usual lecture rooms and libraries, thoroughly equipped laboratories of all kinds, *e.g.*, for agricultural and dairy work, for chemistry, for forestry (manufacture of various forest products, such as charcoal and by-products in the distillation of wood, distillation of camphor, etc.), zoological, entomological, botanical (morphology and pathology of plants), veterinary, sericultural, etc.*; also the usual Museums and of course a Veterinary Hospital. The farm extends to 38 acres divided into areas for practice, for experiment, for botanical specimens and nurseries, and for example farms. The practice farm serves for the instruction of the students in ordinary cultivation and farm management and in the use of new manures such as oil-cake, superphosphate, etc.; the experimental farm, provided with all scientific necessaries, is for the use of professors and students engaged in special investigations, the results of which may partly be noted from the list of above 200 scientific bulletins already issued by the College. The nurseries and botanical gardens serve both for instruction and experiment in tree culture and for scientific enquiry, and there is also a garden for the growth of special exotic crops. The example farm is perhaps the most interesting; in answer to a query during inspection whether the College had set apart an area as a peasant farm for example and demonstration in peasant farming and for ascer-

* In the silk-worm rooms two Bengali students were engaged; it was said that they were very intelligent and doing very well, but that the language was the great difficulty, since Japanese, sufficient for profiting by technical lectures, was very hard to learn; practically the communications were made in English. This appeared to be a difficulty common to all Indian students for at least a year or two; colloquial Japanese sufficient for ordinary purposes is hard enough to learn, but technical Japanese lectures and Japanese text books full of Chinese ideographs, present immense and lengthy difficulties; it takes even a Japanese boy many years to read and write properly. For instance, the curriculum for each year in B class agricultural schools and the preparatory course in A class schools contains "ideography" as a necessary subject and by the curriculum of an A class school (in all of which "Reading" is part of the course in each year), students are practised in reading "sentences mixed with Chinese characters." Probably no Indian student ever learns to read Japanese text-books.

taining the conditions and difficulties of peasant rural economy, the reply was that there are *two*; and with the usual Japanese thoroughness they have secured comparative results by arranging that one farm of between two and three acres (the average size of a peasant farm) shall be worked as a farm near a city with plenty of manure and a good market, the other of similar size as though a purely rural farm, dependent on its own manurial resources and on a very moderate outside market. The farms are worked by ordinary peasant farmers under the immediate supervision of the College authorities, and being side by side, the difference in the crops, both in nature and number of the crops grown and in their quality, is obvious to ordinary observation, and the comparative results serve not only as most suggestive object lessons to the students, but as gauges to the authorities not merely of the resources and the results of farming as necessarily practised by the great bulk of peasants, but of the difficulties and vicissitudes which they undergo where petty farms are more or less self dependent; they are splendid object lessons in rural economy. The tillage and cultivation in each farm were precisely such as an ordinary peasant would, under the circumstances of such farms, have carried on; his stock (no cattle of *any* sort in either farm) implements, stores of manure were those which the farmer, in either case, would work with, and the crops just what he would be able in each case to grow. The neat wooden cottage was exactly that seen throughout the country; his sunk earthenware vats of excreta, his heaps of compost, were precisely of the familiar type, but the "suburban" farmer was able to buy and store much larger quantities of manure and to grow richer and more varied crops than the other.*

The forestry branch is mentioned in paragraph 148; the course is thorough and practical and the endowments of forest immense.

The veterinary hospital is within the grounds of the college and is utilized as a public hospital for all classes of animals.

*It was first on this farm that two suggestive replies were given by the Professors and practical instructors; one a reply of astonishment that India should neglect the use of human excreta as an essential part and *sine quâ non* of farm management; 'What! lose manure worth hundreds of millions of yen annually" was the purport of their remarks; the loss of the stores of potential wealth in this material struck them as wilful and wicked waste; in Japan its constituents, properties, management, and use are not only the subjects of scientific enquiry at the College and experimental stations, but the results are popularized for general information, (see above *s.v.* "manures"). The other was the reply (accentuated by similar surprise) that in Japan no crop is ever grown without its own specific doses of manure; even interstitial crops in the furrows between crops growing in the ridges get their preliminary and subsequent doses, usually of liquid human excreta.

147. The college also contains an institution for giving a one-year course in agriculture to normal school trained teachers who will take charge of agricultural teaching in the elementary schools provided with supplementary courses. A very useful function of the college is its travelling work; last year 16 tours were made by instructors of the college for the practical guidance of the students whom they personally conducted; 10 tours were also made by its delegates for the purpose of scientific investigation. Three separate tours were also made in foreign countries during the year by delegates from the college; it is a way they have in Japan; the gathering of knowledge, the picking of the brains and experience, and the observation of the difficulties and mistakes of other countries, are primary considerations with them; expense, even in this comparatively poor country, is secondary. One notable result is that the poor country is growing rich, the last is becoming first.

148. *Education in Forestry.*—One great aid to the growth of sound principles in woodland working as an item of agricultural practice, is the education now given in forestry and dendrology. There are of course several high grade forestry schools for the training of regular foresters, the finest being the Forestry branch of the College of Agriculture in Tokyo where beside the ordinary sylvicultural training given to all agricultural students, a complete course of forestry is given to students of forestry; the thoroughness of the course may be judged by the fact that the college forests are above 63,000 acres in extent in several parts of Japan proper, besides 144,000 in Formosa; the students have therefore every opportunity for practical work. There are also collegiate courses at the Sapporo Agricultural College and at Iwate, as well as a special Forestry Training School at Meguro which alone is under the Department of Agriculture, all others being under the Educational Department. But for general students there are also about 110 agricultural institutions scattered over the country where the principles and practice of forestry are taught; these are largely of the secondary grade in which forestry is a subsidiary branch of agricultural teaching; in a prefectural secondary school of agriculture that was personally inspected there were 230 students, all sons of farmers, who were receiving a training in forestry principles as part of their course; an extensive area—about 500 acres of forest—had just been added, some miles from the school, where the lads were to learn practical work instead of mere dendrology on the school farm. In a smaller upper primary communal school with 115 boys, similar but less advanced tuition was being given; there was a good piece of forest two or three miles away which formed part of the endowment of the school, and in this and in

the class room both arboricultural and sylvicultural principles and practice were taught. As forestry or sylviculture is, except in the special forestry schools, taught as a branch of agriculture, reference is requested to the paragraphs on agricultural education; suffice it to say that many thousands of lads are being annually instructed, thousands of them practically as well as theoretically, in this important subject.

149. *Farm schools.*—The above schools and colleges are all under the Department of Education but there are also rural agricultural schools under the Agricultural Department. These may be called "Farm schools" where the class room, though well in evidence, is subordinate to good practical teaching in the field. The regulation of 1899 relating to these schools provides that they shall be established and maintained by the prefectures, that their object shall be such instruction in farming as is necessary for actual cultivators with, if advisable, mensuration, physics, natural history, etc., as additional subjects, including veterinary teaching when the prefect considers it desirable; the whole course shall be one of two years or less. The school staff may also be required to give itinerant courses and lectures. Apparently these schools are intended usually to be established in connection with an experimental station; the regulations guiding them are of similar date, and, like one or two fishery schools, they are usually found attached to such stations. One school visited was so connected, and the 16 pupils (boarders) worked on the station farm; they were taught by an independent staff but doubtless the station staff also assisted; a special branch of the school gives courses of lectures in selected localities for a few days at a time. The school was, as usual, of district (prefectural) origin and is paid for from district funds. The number of similar schools is not known but probably these are the several (five or more) "Agricultural institutes" mentioned in "Japan in the 20th century" as under the Minister of Agriculture, and intended to impart to farmers' sons and farmers generally some elementary knowledge of the general principles of agriculture and allied arts. These schools obtain grants-in-aid from the Imperial treasury and turn out every year a considerable number of passed students.

150. *Private schools.*—There are several private agricultural schools, notably a High School of Agriculture founded and managed by the "Agricultural Society of Japan" mentioned below.

151. *Itinerant teaching.*—A notable feature in agricultural education of a different sort, viz., for adults, is seen in the

travelling lecture and sessional school system found all over Japan; these correspond to the "Wanderlehrer" of Germany and France. The lectures and instructors are above 300 in number, serve under the Department of Agriculture, and are (usually) attached to or form part of the staff of the numerous experimental stations; at the Kyoshu experimental station which was personally visited, there is a staff of seven travelling instructors, and during the year sessions (illustrated lectures, conferences and discussions with the farmers, etc.) are held for five days in at least three places in each of the 19 counties of the district; it will be recollected that a district is smaller and less populous than a Madras district so that a county represents a very small taluk or even a firka. These itinerant schools worked from Kyoshu, began in 1900 when 45 sessional schools were held, and have increased steadily till in 1905 no less than 254 or 13 per county were held; all these are held in connection with the local Agricultural Associations.

Further information on the class of agricultural education afforded by the experimental stations and associations will be found below. It merely remains to add that in addition to the general or special teaching in sericulture given in many agricul tural schools, there are two Imperial and 125 or more local institutions, *solely* for sericulture, in which sericultural education, scientific or practical or both and lasting from a few months to two years, is given to thousands of students; the graduates from the two Imperial institutions alone number considerably above one thousand.

152. *Results and cost.*—The following statistics have been obtained from reports as to the general results and cost of ordinary agricultural education.

The schools of the A and B classes have since their establishment passed out 16,823 graduates; the supplementary schools no less than 223,389. The latter and those of the B schools have mostly returned to agriculture proper; those of the A class became agricultural officials, teachers, experts (by further training), officials of agricultural associations, etc., besides returning to agriculture. It is impossible to estimate the value of such a mass of educated young men thrown into agriculture with their minds thoroughly opened not only to the difficulties of their business but to the means of overcoming them and of developing the industry. Most of these students come from the farmer class.

The principal professors and teachers of the schools are of course men highly trained in the Agricultural College.

The cost of all agricultural education, exclusive of the Agricultural Colleges, is not quite certain, but is said, for 1904, to have been Rs. 44·3 lakhs, of which Rs. 4·8 lakhs were contributed by the Central (State) Treasury, and the rest by the local treasuries. This includes 118 A and B agricultural schools, 7 fishery schools, 1,436 supplementary agricultural schools and 41 supplementary fishery schools. The cost for the A schools was Rs. 10·82 lakhs and that of the B schools was Rs. 2·13 lakhs.

Experimental Stations.

153. Another form of education or of assistance to the farmer, is in the experimental stations. It is recognized that while school education is for guiding the minds and habits of youth, the adult at practical work requires other kinds of help and teaching, and these stations have therefore been established to ascertain by *experiment the problems of local farming and the best solution of such problems, to test new methods, materials, and products, and to teach successful results and popularize new ideas by lecture and demonstration.*

154. The first experimental station was started at Tokyo about 1886 beginning with small and simple experiments by college graduates "in co-operation with farmers who allowed their own land to be used for the purpose of experiment"; the results achieved in fertilisers, seed selection and other matters were encouraging and led to the establishment in 1890 of the nucleus of the present central station at Nishigahara in an outskirt of Tokyo. This was further developed in 1893 with a proper grant of funds; six branch stations in sites chosen with regard to agricultural needs, were also instituted and three more in 1896. The regulations order that the stations shall (1) make experiments calculated to improve and promote agriculture, (2) open agricultural lectures for farmers, (3) make chemical researches on soils, fertilisers, farm produce, and technological products having close relation to agriculture. Under these general instructions divisions of agriculture, agricultural chemistry, entomology, pathology, tobacco, horticulture, and stock breeding (only in a special station) have been formed, in which all possible matters connected with agriculture, general and

* It must be remembered that in Japan the authorities are not contented even with organising a complete network of agricultural education; agriculture and the agriculturist were considered together and from many points of view, resulting in a complete and almost, if not quite, unparalleled nexus of organisation; education was at once followed by experiment and by demonstration, and the acceptance of demonstration was stimulated by the universal formation of associations which brought both officials and scientists into ready and friendly touch with the farmer.

special, are investigated; details are unnecessary, but it may be noted that the analysis of fertilisers, soils, &c., for private persons is one item, and the teaching of pupils in the tobacco schools and fields is another. In addition to experiment they are required to answer queries from the public, give lectures to farmers, conduct experiments suggested *ab extra*, make special enquiries and prepare and issue (gratis) the necessary reports and bulletins which are already very numerous. Pupils paying their own expenses may be taken both at the main and branch stations.

155. For carrying out these duties it is provided that not more than 40 experts and 47 assistant experts *plus* a number of clerks, may be appointed for the main station alone and the necessary staff for branch stations; in 1903 there were 19 experts and 21 assistants at the central station besides 15 experts and 19 assistants at the branch stations of which all but 3 were abolished on the formation of district stations. The cost of the central station in 1902 was Rs. 2,17,930; the area of land under occupation was 22·5 acres of all classes including woodlands, and the buildings occupied nearly $\frac{3}{4}$ acre comprising thoroughly equipped laboratories for each division, glass houses with lines of tram rail for the rapid housing or exposure of the lines of experimental pots, nurseries, etc. On personal inspection in 1906 the completeness of the equipment and the enthusiasm and knowledge of the experts equally divided one's admiration and envy. Each of the now existing three branch stations is specially devoted to a particular line of investigation, but also carries on such general work as the analysis and examination of fertilisers at the request of the public or otherwise, supervision of experiments entrusted to farmers, the giving of agricultural information and lectures, and the carrying out of special experiments. The above institutions are under the direct supervision of the Department of Agriculture and are paid for from Imperial funds.

District Stations.

156. But it was early recognized that these stations must be much more numerous though of simpler aim and organisation, must take charge of more *local* investigation since districts differ widely in soil, climate, products, pests, &c., and be more in touch with local institutions and persons. Such stations would take off from the central station all more or less routine and popular work and leave it free for purely scientific research. Consequently, about 10 years ago, Government offered State aid, extending to an aggregate maximum of Rs. 2,25,000 annually

(now Rs. 3 lakhs), towards the starting and upkeep of prefectural (district) stations, with the results that, in 1905, there were 42 such stations costing about Rs. 6·5 lakhs per annum, the whole being defrayed from district (prefectural) funds aided by a moderate Imperial grant apparently about 25 per cent. In addition to these there were numerous county (taluk) stations for simple classes of work including demonstrations, and town or village demonstration plots have also been established either by the communes or by a body of young farmers. The work of the stations is largely practical, demonstrative, and educational.

157. The regulation of 1899 which controls the establishment and work of these stations provides that they shall conduct all kinds of experiment necessary for the particular conditions of their localities. For since climate, soils, products, etc., all differ, each prefecture requires a station, besides branch stations in counties or towns, in order to determine the most suitable kinds of seeds, trees and animals, the best methods of cultivating and planting, the most useful and profitable manures and the best modes of applying them. The regulation also requires stations to undertake itinerant schools and lectures by experts, to distribute seeds, plants, silkworm eggs, etc., to conduct analyses of soils, manures, and products, to determine the quality of seeds, plants, etc., and to conduct any experiments required by the Agricultural Department. Reports of experiments must be duly published for general information at least once a year, as also a general annual report of the work done.

158. In 1906 a law was passed (repealing a former law) regulating the grant of Imperial subsidies to stations for experimenting in Agriculture, Industries, and Fisheries, and to the industrial schools attached to them; the total grant is Rs. 3 lakhs (an increase from the former Rs. 2·25 lakhs), and grants not exceeding the whole annual cost may be given for five years certain, and may be subsequently continued. Primarily the grants are only for prefectural stations and schools, but subsidies not exceeding *half* cost may also be given for material, machinery, or for special experiments, to stations established by counties or towns. The Minister may also entrust experiments to a (private) factory and may defray the full cost of such experiments.

159. The statistics and record of a visit to one district station —that of Kyoshu in Aichi-ken—will give a good idea of its objects and work. This station, a few miles from district headquarters (Nagoya), was started in 1896 with eight very modest buildings and sheds covering a total of 620 square yards; four officers were in charge and the first year's cost was Rs. 6,100.

The following table gives a conspectus of some of the work done, cost, etc.:—

Year.	1896–7.	1901–2.	1903–4.	1904–5.	1905–6.
Total cost	Rs. 6,150	Rs.25,317	Rs.39,823	Rs.32,583	Rs.30,159
Number of buildings	8	13	36	36	36
Area of buildings (square yards).	620	1,480	3,712	3,712	3,712
Farm area (acres)	6·66	6·66	11·29	11·29	11·29
Number of staff	4	11	13	11	11
Number of sorts of experiment.	19	58	91	175	175
Classes of experiment	Common agriculture.	Common agriculture, analysis, entomology, horticulture.	Common agriculture, analysis, entomology, horticulture, poultry, silk.	As in 1903–4	As in 1903–4
Number of analyses (for the public).	...	...	...	37	180
Distribution of seeds. (to persons) ...	...	291	1,309	17,988	21,658
Distribution of vegetable seedlings.	...	...	...	1,950	1,800
Do. of young fruit trees.	...	...	...	2,052	2,700
Do. of breeding poultry.	...	...	29	47	138
Do. of eggs for hatching.	...	...	310	1,142	3,102
Experiments outside of station...	...	1	15	21	32
Number of sorts of publication.	...	4	5	12	16
Do. of copies of publications issued.	...	2,250	16,500	27,370	42,630
Do. of itinerating (sessional) classes	...	173	183	258	254
Do. of visitors	...	3,177	11,356	13,064	16,481
Do. of letters sent and received.	...	4,729	7,542	9,329	10,321

160. The years between 1896 and 1901 have been omitted in this table, but show a steady growth in every subject. The table itself displays the growth of the institution, and it will specially be noticed that although the years 1904–5 and 1905–6 showed a decrease in staff and cost (owing to retrenchment due to the war) every item of work greatly increased notwithstanding that many young educated farmers had gone to the front; more experiments were made, far more seeds, etc., were issued, far more publications were distributed and there were many more visitors and written enquiries. Nothing can better show the growing interest taken by farmers in the station.

161. The General Superintendent is the Principal of the A class Agricultural School at Onju described above, but only visits the station; the resident experts are of course trained Agriculturists, and there are seven travelling instructors attached to the station who give lectures and instruction and hold conferences for five days in at least three places in the 19 counties or

taluks of the district; the table seems to show that this minimum was largely exceeded. The officer in immediate charge, a trained expert of enthusiasm and skill, explained that the use of manures, the dissemination of better seeds, fruit-trees, and poultry, and the education and stimulation of the farmers, were matters chiefly kept in view at this station.*

162. In this rich and crowded part of the country new manures were needed and imported, *e.g.*, sulphate of ammonia, phosphates, etc., but their precise use was not understood so that waste and discouragement resulted; the station takes these manures and experiments with them on *local* crops and soils and gives the results to the farmer. In the matter of fruit trees there is an extensive orchard and nursery of the best sorts of indigenous and foreign fruit trees (from America, France, etc.); the acclimatization and proper treatment of these latter are sought and those best adapted to soil and climate are grown and distributed. The show of poultry is excellent and with the liberal distribution of breeding birds and eggs must be of much assistance to the farmer. The laboratories are thoroughly well fitted, and analyses of soil and manure are made gratis for Agricultural Associations and other bodies and for a trifling fee for private persons.†

163. There is a useful Museum with a variety of publications for free consultation, and, as shown by the table, visitors are strongly encouraged; during the forenoon of my inspection several farmers and others were examining fruit trees and crops, questioning the employés, interviewing the experts, and reading the publications. The publications are an important feature; besides the annual report there is a monthly journal and a digest of experimental results, and numerous bulletins on special subjects are continually issued, *e.g.*, pamphlets in simple language on farm management with illustrations of tools, sheds, etc., the best

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* At the Mito agricultural station also visited, tobacco, vegetables, and crop diseases were among the chief objects of study; smut and other fungoid diseases were seen to be prevalent among the crops of the neighbourhood.

† At Mito experimental station the fees for private analysis are 5 annas (20 sen) for qualitative analysis of manure as regards a single element, *e.g.*, the phosphoric acid in bone; 10 annas for quantitative analysis of the first and 5 annas for the second or third element. For a complete quantitative analysis of soil Rs. 1-8-0 for the first element and 12 annas for each other element; Rs. 1-8-0 for a qualitative and Rs. 3 for a quantitative analysis of water; 12 annas for a qualitative analysis for one and 6 annas for each other element in cattle food and other manufactured products such as sugar, soy, etc., with double rates for quantitative analysis. No charge at all is made for analysis for official purposes, for industrial schools, for other experimental stations, for Industrial Guilds, or for Agricultural Associations. Since practically all farmers belong to one or other Agricultural Associations, this means that analysis can usually be had free.

methods of making, storing, and using composts and other manures, the quantities found best in various localities, and so forth; on fruit trees, their value, treatment, etc.; on winter crops; on poultry; on the chief cereals; on vegetables, etc. Some of the most useful are printed on sheets to be hung up in schools and cottages; these treat of one subject only, *e.g.*, of rice culture, the sheet regarding which is printed in colours and gives a picture of healthy and diseased plants above and below ground, with the insects beneficial and harmful to rice, a series of versicles (written in the popular Japanese character only, without Chinese ideographs) embodying the chief points in its cultivation, and most simple but useful diagrammatic representations (by lines of various length) of results obtained by seed selection, by the use of various manures in the seed bed, by harvesting at different periods, and, above all, by various classes of manure in the field. The diagram for manures in the field is here reproduced and shows at a glance the respective gross produce and the net profits obtained by the use of eight different mixtures, the gross return being marked by the red lines and the net profits by black; for instance, it will be seen that while the largest *gross* return is obtained by using a mixture of fish (herring), phosphates, and compost, the *net* profit, by reason of the cost of fish, is only second, and far below that obtained by the use of a mixture of human excreta (X), phosphates, and compost, which moreover produces the third best gross outturn; this confirms one thesis of this note, viz., that human excreta are among the best and certainly are the cheapest of all the Japanese manures. It will be noticed also that phosphate of lime is an invariable component of the rice manures, an ingredient never added in India though bones are abundant. The effect of bean-cake is noteworthy especially as regards net profits; this manure is now being imported from Manchuria in immense quantities. The great value of fish as a fertiliser is very marked and emphasizes the importance of developing its use in India.

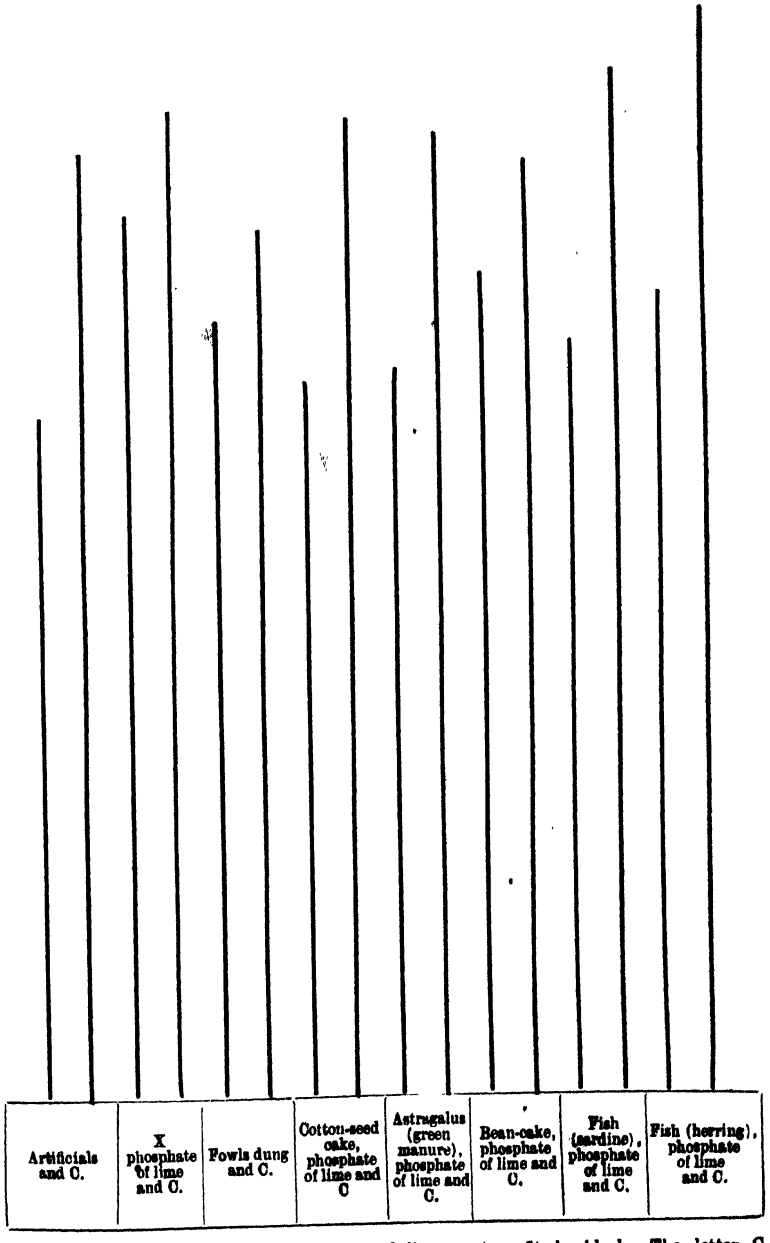
The correspondence is also large and important, a great variety of queries coming in from the various Agricultural Associations, the officials of which are frequently men of agricultural education, and from educated farmers.

AGRICULTURAL ASSOCIATIONS.

164. Throughout the sections on Agricultural Education and Experimental Stations there has been frequent reference to Agricultural Associations, and these are among the most remarkable evidences, and are becoming most powerful instruments, of agricultural progress in the country. As pointed out

To face page 96.

DIAGRAM.



N.B.—Gross outturns are shown by the red lines; net profits by black. The letter C means compost or "manurial earth," invariably used in Japanese cultivation; see *s.v.* "manures."

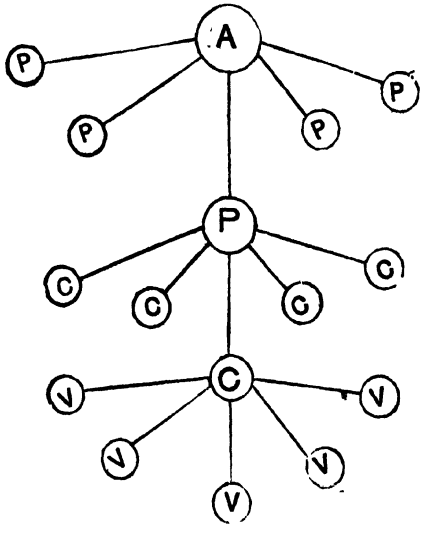
by the late far-seeing Director of Agriculture in France, M. Tisserand, it is impossible for a Government to influence individually millions of petty peasants; they are *individually* too isolated, too suspicious, too shy, to accept new ideas, to undertake experiment in new methods; similarly they are too poor, too powerless to produce the best products, to get the better of the middleman and the best of the markets. There must be some organisation which enables Government to act upon a body of men at once and to serve as intermediary between the Government and the individual; an organisation which can be advised, educated, reasoned with, and listened to, which will discuss together the suggestions of authority, and will, through its better educated or bolder members, provide intelligence to absorb new ideas, find courage and funds to attempt new methods, and combine both for the improvement of products and for the better sale of the same. Similar views actuated not only the Government but the thinkers of Japan, and the result is that practically the whole agricultural population of Japan is united in various forms of Association; probably there is no country in the world, not even Germany, where Associations have taken such hold and, though dating only from the last few years, are beginning to exert such influence. The object of the Government is gradually to shift the work of agricultural development from the shoulders of Government to those of the people themselves, recognizing that it is not that which is done *for* the people but that which is done *by* the people that is truly beneficial, and that real progress can come, only from within; this shifting of work is impossible unless there are popular bodies to take on the work. Not only so, but there is much that even the most highly organized Government, short of that in an imaginary socialist Utopia, cannot possibly do or that it would be well for them to do if they could, for fear of obliterating self-help as a national virtue; Government can experiment and point the better way and educate the people into a readiness to accept that better way, but it is only the people themselves who can work out the several improvements. It is here that the Associations step in; their experts and the more intelligent of the members receive and assimilate the new knowledge and not only work this knowledge into local fact but influence the more conservative or ignorant members into following their lead. The best explanation, however, of the functions of these Associations will be found in the description of their correlation and work.

165. *Classes of Associations.*—Associations are either of a private character such as the Agricultural Society of Japan, or public established under one of several laws. These latter are (1) Agricultural Associations under the law of October 1905

(revised from the law of 1889); (2) Agricultural Guilds under the law for Industrial Guilds of March 1900; (3) Agricultural Associations under the law of 1900 governing Trade Associations for staple products; each of these classes has its own special functions. There are also joint stock agricultural companies.

166. *Associations under the (revised) law of* 1905.—These are the Agricultural Associations proper (Keito-Nokwai), and are divided into Prefectural, County (taluk), and Village Associations, of which there were recently 46 and 579, and 11,968 respectively, as compared with 47 Prefectures (including Hokkaido), 638 counties (gun), and 13,509 towns and villages; the number of members is not known since there is no general report, but in the Aichi prefecture with a gross population in 1903 of 1,692,744 in about 308,000 households, there were 210,750 members of Agricultural Associations of this class. As will presently be seen, membership is practically compulsory.

167. *Relationship of Associations.*—These Associations are not isolated but are all interdependent within the several prefectures. The following diagram shows the relationship:—



The starting point—not necessarily first in time—is V representing the Village Association which consists of all the farmers of a village; each of these units elects a deputy, and those within each county or taluk form C or the Taluk Association; these in turn elect deputies who constitute the Prefectural Association. The last-named elect deputies who form a standing Committee or Central Agricultural Council which, however, is not an Association established under the law of 1900.

168. *Legal conditions of Association.*—The law provides that these Associations though juridical persons shall not be business societies trading for profit; that is left to ordinary companies; they are simply Associations formed to promote the interests of the agriculturist and the development of agriculture by experiment, discussion, education, and so forth. The members of Town and Village Associations shall be the proprietors and cultivators of land within the boundaries of the Association; County (Taluk) Associations shall be constituted from the Town and Village Associations within the county, and Prefectural from the City and County Associations within the Prefecture. Before any Village Association can be formed not less than two-thirds of the persons qualified for membership shall consent, provided that such two-thirds own not less than two-thirds of the cultivable land; but when such Association shall have been formed *all* persons qualified for membership must join it. The law makes provision for the working of such societies and for the appointment of deputies, officers, and honorary members; the income of the Associations shall be derived from its constituent members, whether persons or Associations; and one curious provision is that members of a Village Association may pay their fees in kind. The Civic Corporation within which an Association is established may lawfully contribute towards the funds of such Association. All Associations must report on agricultural and other matters as required; these reports appear to be the basis of the very detailed statistics presented in the annual report of the Agricultural Department; they are also entitled to make suggestions on agricultural matters. The authorities have full power to examine the affairs and books of an Association and to pass such orders as may be needed.

169. An ordinance of the Department of Agriculture of 1903 requires that Associations shall report on the following items of agriculture, viz., areas and outturn of the several crops, distinguishing between single and double crop, area (*a*) tilled by cattle, (*b*) by manual labour, number of cultivating cattle, area of land owned or leased by each farmer, number of households and of persons (*a*) exclusively (*b*) secondarily engaged in cultivation, number of persons agriculturally educated.

170. *General finance.*—These Associations, it will be noticed, are financed by the members, *i.e.*, by the farmers' subscriptions, aided apparently by donations, since the Village Associations support those of the counties, and these again those of the prefectures; the farmer pays for all. *Per contra*, the Prefectural Associations make grants-in-aid to the Town Associations whenever necessary and possible, while the Government, Imperial and Prefectural, materially assists the whole organisation by liberal

subsidies to the prefectural societies according to the Rules of March 1900. In 1905 the Imperial Government gave Rs. 1·42 lakhs (in 1904 and 1906 Rs. 2·2 lakhs); the Prefectural Treasuries gave Rs. 3·45 lakhs in addition to the Imperial grants; these latter are, by the rules, applied for and given to Associations direct by Government. In 1905 the total expenditure of Prefectural Associations was Rs. 8·9 lakhs, so that more than half was provided by Government either Imperial or Prefectural.

No general report is drawn up of the income, expenditure and work of the various classes of Associations, and statistics and facts can only be guessed from considering the reports (given below) from specific instances. But in 1903 the total expenditure by 46 Prefectural Associations was Rs. 7·4 lakhs, of which Rs. 3·9 lakhs were expended direct by the Associations in practical work (see below), Rs. 2·45 lakhs in subsidies to lower-grade Associations, Rs. 30,360 in issuing bulletins, Rs. 90,260 in payment of experts and staff, Rs. 29,930 in the expenses (travelling, etc.), of the various councils, and so forth.

171. *Prefectural Associations.*—The work of these will best be described by taking a concrete case. The Kanagawa Prefectural Association consists of deputies from the 11 Taluk * Associations, and its objects as declared in its rules, are

(1) the statistical investigation of agriculture (within the prefecture);
(2) agricultural education;
(3) agricultural improvements;
(4) improvements in the secondary occupations † of farmers;
(5) the encouraging of the formation of agricultural associations;
(6) supervision and encouragement of taluk associations; and
(7) any agricultural matters of importance and urgency.

The income of the Association shall be provided by a levy from the Taluk Associations according to the respective area

* The word "gun" usually translated "county" will here be translated by "taluk" as this Note is for Madras reading; the division is a small one with a population of from (say) 50,000 to 100,000.

† See footnote to paragraph 55 *supra*; Japanese peasants, like those of Switzerland, Germany, etc., occupy their non-cultivation seasons, especially winter, in a variety of small industries; as there are no caste rules or disabilities, this is easy. One item of work to be undertaken by Madras Associations will be the stimulation of similar subsidiary employments especially in the hot weather, such as the removal of tank earth to dry sandy fields, the working of nurseries for the growth of tree seedlings, the preparation and sale of products (fruits, firewood, etc.) from the trees so grown, the manufacture of good compost, the growth and feeding of fish where ponds or wells are available, the growing of poultry, and so forth.

and land value of the Taluks; donations and subscriptions for particular objects will be received, and subsidies obtained from Government. There are the usual rules for the conduct of business. The Association had in 1905 an income of Rs. 12,510, which included Rs. 4,950 from its constituent taluk associations, Rs. 2,460 from the Imperial Treasury, Rs. 4,500 from the prefecture, Rs. 441 castration fees, and so forth. It spent in the same year Rs. 11,200 chiefly in practical work, salaries, which included travelling of experts Rs. 1,098, field consolidation Rs. 1,830, sericulture and various encouragements of agriculture including village technical classes Rs. 725, bulletins Rs. 377, castration of horses Rs. 320; subsidies were also given to lower grade associations, Rs. 4,800, while salaries, wages, postage, subscription to the Central Society, and miscellaneous, cost about Rs. 1,000.

172. The actual work done comprised the teaching, by many practical examples and by lectures, of the disinfection of silkworm houses where silkworm disease had got in; exhibitions in 6 taluks at which the Association gave 173 prizes; the castration of 272 horses together with the distribution of explanatory pamphlets; the consolidation * of fields in 12 villages affecting about 2,500 acres of wet land, together with lectures and papers illustrating the process and its importance; the subsidizing of three temporary agricultural schools or classes opened by taluk associations; the investigation of agricultural conditions, including statistics, for the Department; an enquiry into agricultural implements, etc.; encouragement to agriculture by the tours of the Prefect's agricultural expert, by subsidies to taluks as premia for improvements shown therein, by certificates of honour to successful cultivators;

* As mentioned in paragraph 15, the various parcels of land are extremely small, irregular in shape, disproportionately occupied by boundary banks, and *very scattered*, as in France and Germany, so that, as in those countries, it is being attempted by a process of exchange to consolidate the several plots held by each peasant, to straighten crooked boundaries, and to reduce their number, in order that, as far as possible, each farmer may have his holding in few and contiguous fields and thus save time, space, and labour in their cultivation and be enabled to live in the middle of his land; in Japan it is found that there is sometimes a gain of 5 per cent. in cultivable area from the elimination of banks, while the saving in other ways is very considerable; the irrigation channels and drains are also frequently improved by the adjustments. This evil is found in the Madras Presidency also to a great extent, and, as I write, a Deccan (Kurnool) ryot gives this as one reason for the inability of the ryot to live in a homestead on his land. Possibly as Madras Settlement and Survey work proper declines, the "Verkoppelung" of scattered plots will employ the parties, but it would be far better for village associations to carry out the work themselves with the aid of their skilled and hereditary karnam while the village panchayat or the "conciliators" of the Village Association would suitably conduct the numerous and delicate negotiations and bargainings.

the exhibition at St. Louis and in Belgium of ground nut specimens for which a silver and a gold medal were respectively won; the taking part in Central conferences and meetings; the issue of 4,200 copies of the bulletin; the grant of subsidies to taluk associations (*a*) according to area, (*b*) according to degrees of improvements shown to have been effected.

173. For 1906–07 the budget provides an income of Rs. 18,300 including Rs. 6,000 from the Imperial and Rs. 7,500 from the Prefectural treasury, and a similar expenditure, and it is noteworthy that the only payments as office salaries are Rs. 315 to officers (as "honoraria"), Rs. 90 for clerks, and Rs. 106 as wages to servants. The programme of work to be done is pretty much as above, but is considerably enlarged in all items; *e.g.*, two more experts and two sub-experts are to be employed and it is noteworthy that the salaries for these four men only aggregate Rs. 1,971 *plus* Rs. 810 for travelling expenses. The allotments for temporary schools, prizes to cultivators, subsidies to farmers who will experiment on improvements, sericulture, stock breeding, field consolidation, etc., are all enlarged, and one important new item is the promotion of Industrial Guilds (associations for credit, sale, and purchase; see below) to help the farmer to obtain capital for improvements; the Association will establish a typical Guild as an object lesson in the management of such societies which are generally novel. The breeding of stock, especially horses, and the improvement of implements will also absorb much attention. It will be seen by the above description of an actual Association, how useful such an organisation may be, and how far-reaching its influence, and as yet these are only in their infancy; it is obvious that the hope of transferring the work of agricultural improvement from the Departmental Bureau to popular and local bodies is in a fair way to become a reality if other Prefectural Associations are equally busy; still more so if the lower grade Associations are doing their part. This will now be demonstrated by examples of such associations.

174. *Taluk* (*county, gun*) *Associations.*—In the same Prefecture there are 11 taluk associations with an aggregate income of about Rs. 17,000 and a similar expenditure; their objects and operations are similar to those of the prefectural associations which indeed frequently carries out work through them or aids them in such work by subsidies. The report of one such Taluk association shows agricultural lectures by experts brought down from the Agricultural Department, College, or Experimental Station, temporary, short-course schools on practical matters, small exhibitions of or competitions in produce, the delegation of deputies from each of the 14 constituent villages to other localities to note new or different agricultural methods and practices, the

distribution of seed and seedlings (a very important item in some taluks, one spending Rs. 1,500 on this), the inculcation of improved methods (*e.g.*, the testing of seed by gravity in salt water, improvements in seed beds, improvements in preparing compost, prevention and destruction of insect and fungoid diseases), the employment of itinerant experts, the wholesale purchase of manure, etc., from joint funds for groups of members, and pecuniary (?) assistance to members in buying seed, implements, books, etc.

175. The report of a Taluk association in another Prefecture records a splendid year of work done.

(1) A competition in rice growing amongst the 11 constituent villages; each plot was of not less than ⅛ acre (600 sq. yards), and the Association appointed 5 inspectors to visit each village, select the most successful example and award the Prefect's prizes. This excited the keenest interest and much effort to win the prizes. *

(2) 35 lectures were given on various practical subjects in different places, besides a special course on sericulture by an expert on the request of some farmers.

(3) Investigation of productivity and food consumption in each village; this was undertaken by 8 commissioners specially selected, who presented a valuable report.

(4) The promotion by lectures and distribution of pamphlets of Industrial Guilds.

* In 1887 in a report on the Gooty Agricultural Exhibition I strongly advocated this prize-field system as against or to supplement the ordinary exhibition prize-sample system. The proposal was made upon an Irish exemplar as described by Prof. Baldwin, and it was shown that not only were the absurdities of the prize-sample system avoided, but the keenest emulation was produced, not from the value of the prizes, which were trifling, but from the innate love of good farming which was stimulated into activity by the new system. Our new Associations should consider this matter. Japanese prizes or premia are usually very small; it is the local honour rather than the prize which is sought; a rupee, a fan, a sickle, a small lacquer rice bowl, etc., or mere certificates, are deemed sufficient, coupled as they are with accessions of *local* honour and respect. In one case it will be seen that rewards to faithful servants for at least three years' good service under the same employer varied from 12 annas to Rs. 2-4-0. In India even for local purposes we are apt in our English commercial way to think too much of the rupee value of prizes to be offered and too little of their local value in " mariyàthei " (respect), forgetful that the village is the peasant's world and that he far more values an access of such respect *within* his village than a mere take-it-and-have-done-with-it money prize at a distant exhibition. One old-time Collector carried about a cart-load of hoes (mamoties) and other simple tools, cloths, etc., and would present them in person to any ryot whose field he admired or who had planted a good tree or trees, and the name of Blackburne and the facts of such local honourings are current in the Madura villages to this day. We do not make enough either of village honours or of the " village," and we ought to re-create it instead of weakening it and its organisation and its local influence and the local repute and status of its leading men.

(5) Magic lantern lectures; these were given on the application of village associations, and related to agriculture and "morals" (public and private duty).

(6) Detection of adulteration in manures. The work undertaken was the distribution of information regarding simple methods of detection, and the actual examination of samples by local expert and by the department of Agriculture.

(7) The Secretary was sent to a neighbouring district to observe the working of each class of agricultural association and other agricultural matters.

(8) Two temporary schools in villages were opened with 53 and 59 pupils respectively; in one the cultivation of rice and of autumn silk were the subjects taught; in the other the growth of vegetables. There was also another temporary school.

(9) Deputies were sent to a meeting of the Central Council of Agricultural Associations.

(10) Encouragement of autumn silk growth; competitive exhibitions were held by two village associations, and the county sent its expert to assist and judge.

(11) Assistance was given to competitions held by village associations in the matter of rice and barley crops.

(12) Encouragement of vegetable growing by competition and prizes; during the year under report brinjals and sweet potatoes were the vegetables selected for competition.

(13) A pamphlet on the prevention of insect and other pests was distributed.

(14) A large number of questions from farmers on agriculture, sericulture, forestry, fruit trees, etc., were answered.

(15) A skilled smith was appointed by the Association to make improved implements for members, under the supervision of the Association's expert.

(16) Prizes were awarded to persons who had effected improvements in agriculture; *e.g.*, a prize of honour was awarded to a farmer who, after years of study, had developed a variety of rice very suitable to local conditions.

176. As regards these taluk associations it is to be remembered that while operations are originated by such associations, the carrying out of such operations falls in great part to the village associations; in fact the taluk association is merely the congress of the village associations through their deputies, where village needs and problems and suggestions are fully discussed by the several deputies. Hence the resolutions and operations of the taluk associations are really those of the villages, and consequently such resolutions and operations are faithfully carried out in the villages. On the other hand the taluk association is the intermediary which communicates the suggestions of the higher experts

and authorities and the results of their experimental stations to the village associations where, in turn, they are discussed and their deputies instructed. The whole organisation is an admirable nexus of interdependent associations.

177. *Village Associations.*—These are, perhaps, the most interesting of all, as we see in them what the farmers are able to do *for and by themselves* in their own villages. For these associations are simply the united cultivators (proprietors or tenants) of a village, and it is important to know what these men, whose farms average only 2½ acres, can do when instructed and united and led by the best local men.

178. The village association gets down to the people even more than its name signifies, for the association may be subdivided into as many sections or branches as there are hamlets, of between 20 and 40 houses, in the village, and each branch has its own councillor in the association and also its own local head and councillors, the latter representing groups of five houses; this method was decided in a general conference to be the best method of representing village opinion and of communicating information to the individual members. The same conference decided that every effort should be made to secure competent experts for village associations; viz., by offering a suitable salary, by providing that he should have a good position and receive suitable respect (Tam. "mariyàthei"), by sending a student to an agricultural school at the expense of the association or of the Prefecture and employing him as their expert; in one Prefecture an expert has been appointed to each village association in several taluks and paid by the village associations with aid from the taluk associations: these officers are doing much good work.

179. Among the causes which hinder the work of these associations, 14 are mentioned, by village associations themselves, as principal ones, viz.:—

(1) want of agricultural education, and the power of "custom";
(2) the indifference of most landlords;
(3) incompetence of Presidents;
(4) predominance as Presidents of village heads who are men full of other business;
(5) want of funds;
(6) ignorance of agricultural principles among *women* (who are important as workers);
(7) opposition in interests between landlord and tenant;
(8) temptations to seek other more profitable business;
(9) want of proper union (co-operation) among members;

(10) ambition of the young men to obtain other employments (the Japanese translation is "corruption of the thought of young men and their undue ambitions");
(11) political disagreements among members;
(12) defects in the law governing the associations;
(13) unwise methods of encouragement by the authorities;
(14) attempts at improvements unsuitable to local conditions.

180. The following operations are undertaken by the village associations:—

(1) *Cultivation.*—Seed selection, supply, and exchange; establishment of special plots for seed-growing; improvements to seed beds in form, manuring, etc.; establishment of common seed beds for all the members (a great saving in space, seed, and labour); the prevention and destruction of insect and other crop pests; encouragement of use of cattle; cultivation of green manure; improvements in compost; encouragement of second crop cultivation; improvements in the cultivation of rice; the wholesale purchase of manure from united funds; the destruction of field rats.

(2) *Competitive Exhibitions.*—Of staple crops; of other agricultural products; of seed beds; of growing crops (N.B.); of improved methods of cultivation; of ploughs; of silk cultivation.

(3) *Sericulture.*—United action in securing good seed and in preventing infection; in disinfecting; in providing suitable places for killing the pupæ and drying the cocoons; in the improvement of mulberry growth.

(4) *Education.*—The establishment of temporary schools and lectures; *ditto* for women; of night schools; of libraries; of agricultural bulletins.

(5) *Secondary occupations.*—The cultivation of grasses (*e.g.*, *Juncus effusus* and *balticus*) for mats; the weaving of mats; and of straw plaits; the growth of fruit trees and tea bushes and poultry; and the distribution of nests of eggs for breeding.

(6) *Miscellaneous.*—The consolidation of fields; draining; the establishment of Industrial Guilds; the encouragement of thrift; the planting of trees and woods; the statistical investigation of agricultural and village business. Other miscellaneous work is the promotion of meetings, the payment of special honours to leading farmers, the lending of implements and machines, the education of students, etc.

181. The Central Conference above mentioned suggested also the closer connection of primary schools with agriculture not merely by adapting the lessons to agricultural subjects, but by taking the boys to the experimental stations and to hear popular lectures, by employing them to hunt out noxious insects and their eggs or larvæ, by using the school-house for association meetings and lectures, by interesting the boys in secondary occupations, and by establishing school gardens.

182. The following is an abstract of the report of a village association: it has hired an office which is shared by the Village Credit association and by the Village Educational association (this is another Japanese organisation, but is outside the scope of this Note). The head of the village is the President, and the paid employees are, an expert on Rs. 180, an assistant expert on Rs. 60, and a Secretary on Rs. 45 per annum; the rates of pay are worth noting as examples of cheap but good service. The income and expenditure are but Rs. 777 per annum; the number of members 500. The work done is as follows: the preparation of a statistical and economic report of the village of which 200 copies were printed and distributed; the publication of the society's bulletins, now numbering 60; the provision of advertisement boards (a peculiar Japanese practice); the provision of four temporary agricultural classes attended by 33 men, and the despatch of a student to learn about noxious insects and their destruction; the provision of agricultural lectures, of which there have been 53 since the association was established in 1896; the award of honours and prizes to successful farmers (27 since 1896); the grant of premia (of Rs. 2–4 to 12 annas) to faithful servants (11 since 1898 to servants or employees who had served faithfully and for above three years under the same employer); the grant of rewards to persons, especially school boys, most successful in destroying noxious insects; the bestowal of prizes such as implements, fans, etc., to persons who showed the best seed beds; the protection of useful birds and the gratuitous distribution of seedlings to be grown into trees as shelters for birds; the establishment of model compost heaps where economy is combined with large outturns of high quality; field consolidation; experiments in agriculture, sericulture, poultry, and the growth of carp (N.B.) and of young trees; the distribution of seeds, plants, and eggs to the primary school and farmers; the provision of an experimental plot; experiments in poultry raising conducted at the primary school; the purchase and distribution of seed (including astragalus) and fruit seedlings; the disinfection of silk-worm sheds, etc.; field or farm competitions of five kinds each year, viz., for seed beds, rice, vegetables, and silk (house methods, cleanliness, etc.); the

establishment of a mulberry farm. The utilization of school boys and of the primary school is noteworthy.

The budget is too long to insert, but the main feature is the cheapness with which everything is done.

183. Another association did similar work, and noticeable among the wholesale purchases made for the common benefit of members, were about 14 tons of fish (herring) fertiliser, and 5 bushels of clover and 4½ of astragalus seed for planting as green manures; in China clover is the great restorative crop, in Japan it is astragalus, and it is obvious that astragalus is now regularly sown as a green manure.

184. The report (1903) of the Odera village association presents novel and interesting features in addition to the ordinary ones of temporary classes, lectures on holidays, etc., etc.; the particular point to be noticed is the large use made of *common action*—

(1) Eighty-nine members united to form seed beds in common; this was followed by a discussion in the association, as a result of which seven common seed beds aggregating 7 acres were established for the *whole village*. The Director of the association has hired these plots for nine years, and lets them out to members on rent. The seed was tested by the salt-water method on April 3rd; by April 17th the seed beds were ready, and the seed was sown at the rate of 30 bushels to the acre (5 "go", each 1/50 of a peck, per "tsubo" of 4 square yards); the seedlings were transplanted from June 8th to 12th.

(2) Purchase of manures by united funds. The first attempt was in 1902 and being successful, the association borrowed Rs. 2,250 in 1903 and bought 550 bushels of beans, 600 of bean-cake, 8,250 lb. of rice bran, 60 barrels of fish fertiliser (scrap after the expression of oil), and 1,650 lb. of other oil-cake; these were distributed to members and punctually paid for.

(3) Prize competitions for *crops in the field*, both rice and upland. This apparently originated among the students of the night schools (agricultural) and temporary classes, but was taken up by the association in 1901. In 1903 (the third year of competition) it was found that the *average* produce of the whole area of rice (225 acres) in the village was at the rate of 2·95 koku per tan, or almost 60 bushels of husked rice (genmai) per acre!

(4) Large sums were paid for the destruction of a noxious* insect (Chilo simplex) the larvæ of which destroyed that year 2,704,276 rice stems.

* Insect pests seem to be common in Japan; it is common at night to see lantern traps dotted about the fields to attract and snare them.

(5) The preservation and hatching of silkworm eggs in common. Disinfection was also well carried out; all implements were sterilized and the rooms disinfected with formalin spray.

(6) A competition was held for sericulturists, 50 out of 176 houses taking part; the exhibits were examined *in situ* by the judges.

(7) A sericultural association was formed in 1900 by 79 of the association members; the sericultural experts go round the houses at cultivation time to examine the condition of the worms and to give suggestions and advice. A fund of Rs. 1,500 has been formed by the sericultural association which is lent to members for expenditure on their industry.

Future operations are the improvement of manures, the deeper tillage of paddy land, attempts to increase the rice yield to 4 koku per tan (80 bushels per acre of husked rice), the provision of good silkworms and the sale of silk in common, the encouragement of weaving as a secondary occupation for peasant families, and the promotion of thrift.

185. Enough has now been written to show the character of these associations, the work they are doing, the scope of future action, and their already great influence in the direction of improvements and their enormous potential capacity for good. Whatever the primary influence which originated or stimulated the formation of these associations, they are calculated both to arouse an interest in new ideas and to bring new ideas down to the farmer, and actually succeed in so doing; the whole country is being permeated with new ideas and stimulated to new action by the method thus adopted of getting at the individual farmer, viz., by forming these isolated units into societies, by dealing with them in the group, and by showing them the benefits of co-operative union and action. The subject will be developed hereafter in "suggestions for Madras", but the mere perusal of the above is rich in hints and suggestions. One of the foremost is the opportunity which these and other associations give for reviving the position and influence of the village; that wonderful unit cannot indeed re-assume its mediæval position, but, like India in general, should take a form adapted to the conditions and ideas of the 20th century; the ancient co-operation by status must become co-operation by contract; the new village association should largely develop while modifying the ancient municipium.

186. *Industrial Guilds.*—But a still further and very important step has been taken in agricultural progress, viz., in developing through Industrial Guilds, the *business* side of agriculture as in Ireland, Germany, etc. More than half of these Guilds are village co-operative credit societies for supplying the peasant with capital

on moderate and safe conditions. An official record states that "in places where bankers generally exact interest at the rate of 20 per cent. or so from ordinary clients and as high as 30 to 40 per cent from small farmers, the Guild (co-operative credit society) furnishes loans to its members at about 10 per cent.," a remark which throws light at once on the plight of the Japanese rural borrower and on the rate that even co-operative societies think it right or necessary to charge.

The remainder of the Guilds are co-operative village societies for joint purchase, sale, and even production; the co-operative purchase of seeds, manures, etc., and the co-operative placing of the members' produce in bulk on the market; co operative instead of individual purchases and sales. In Japan this is provided for by a separate law for business societies called "Industrial Guilds" which may be independent village societies but in general are either annexes of village associations or are started by them.

187. The Guild system for particular industries, especially silk, has been in vogue to some extent for some years, and even for centuries, but the modern institutions of that name (Sangio-kumiai) established under the law of March 1900 are similar to European distributive associations for joint credit, purchase, and sale of goods; they are not trading companies, but co-operative societies, in which the profit of members is sought either by substituting joint for individual credit, or by substituting wholesale for individual purchases or sale of goods and thus obtaining not merely the pecuniary advantages of wholesale dealings and of the elimination of the middlemen, but the certainty of sound goods. Many of the Guilds are productive as well as distributive.

188. The law governing these associations describes them as institutions established to develop an industry or the economic benefit of the members of an industry either by the provision of cheap capital, by the sale of the members' raw or manufactured produce, by joint purchase and distribution to members of materials, or by joint production combined with any of the other objects. Associations for credit must not, as such, carry on any of the other objects. The Associations may be unlimited, limited by shares, or limited by guarantee of a fixed amount. Being mutual associations of public usefulness they are declared not to be liable to the income or to the business tax, and registration fees are only those prescribed for associations not united for profit. Each member must hold at least one and not more than 10 shares and cannot transfer shares without the consent of the Guild. The law has lengthy provisions for the conduct of the societies and is obviously adapted from the German law for Co-operative Associations (see translation of this law in Vol. II of the Report on Land, etc., Banks) and need not be further translated. The Departmental Rules under the law,

prescribe the maximum value of each share (Rs. 75), the minimum proportion payable, the contents of reports, and so forth.

189. The following descriptions of actual Guilds will be of interest. The first is an unlimited association for credit established in 1901; its paid-up capital is Rs. 20,172 in shares of Rs. 30, half paid up by members, half out of profits; deposits were only Rs. 408; loans in existence Rs. 9,426; the objects of loans must be productive or economical, viz., the purchase of manure, silkworm seed, ginger and other seeds, the buying of land, and the repayment of old debt. The object of each loan must be stated in the application and care is taken that the money is not misapplied; some members have been expelled for disobeying the rules. Loans in general are given on the mere security of the borrower, but may also be given on joint security or on pledge. It is stated positively that members are prospering by their connection with the Association; their household economy is improving, they hold frequent meetings (for mutual instruction) and have opened an evening school for their sons. The Association hopes for an early increase in deposits and anticipates treble the demand for loans; moreover, the members are arranging to establish a Buying Association so as to utilize the benefit of these loans to the utmost, viz., by combining their individual orders for manure into one wholesale order and thus ensuring cheapness and soundness of the goods purchased.

190. Another Credit Association includes ten contiguous villages or hamlets, borrows money from a Local Mortgage Bank (see below) on joint credit, and distributes it to members for the sole purpose of buying manures. Apparently, it has a branch or annex, by which it helps members (and others) to buy manure at wholesale rates by combining their orders; would-be purchasers, if not members of the credit association, must be introduced by members or by guarantors living within the limits of the Association and paying not less than Rs. 15 as land tax. The manures purchased are fish fertiliser, superphosphate, and bran-cake; the estimated cost must be paid up in advance between December 25th and January 25th, and the goods delivered to the purchasers by 1st February; adjustments between estimates and actuals to be made subsequently. Any arrears will be charged at 5 sen per 100 yen daily or 18¼ per cent. The Association sends its inspectors to see whether the manure is being properly used, to give advice, etc.

191. These guilds have a great future before them in assisting the small farmer to cheap credit and good markets whether for sale or purchase; they may be compared with the co-operative societies of the past 10 or 12 years in Ireland as established chiefly through the efforts of Sir Horace Plunkett.

192. *Statistics.*—Starting in 1900 these associations have increased from 21 at the end of that year to 1201 at the end of December 1904; of these 751 were for credit, 75 for sale, 186 for purchase, 24 for production, and 165 for combinations of the last three categories. Dividing them by liability, 728 were unlimited and 473 limited chiefly by shares. There seems to be the same difficulty, as at first in Germany, to get punctual reports from these Associations, for only 571 had reported their statistics in 1904; these showed 45,130 members with a paid-up capital of Rs. 14·18 lakhs and a reserve of 1·38 lakhs; the 404 credit associations reported 31,402 members, paid-up subscriptions of Rs. 12·9 lakhs, loans in the year of Rs. 28·3 lakhs of which Rs. 12·3 had been repaid, deposits received of Rs. 14·24 lakhs and paid out of Rs. 11·09 lakhs, and a reserve of Rs. 19·360. The precise amounts of sales and purchases are not clear, but ran into many lakhs of rupees, the purely sale societies alone having sold produce for members for Rs. 20·3 lakhs.

193. *Trade Associations for staple products.*—These associations (Dogyo-kumiai) differ from both the preceding categories, being groups of persons engaged in a particular industry or trade, associated in view to prevent abuses such as the production of inferior goods, the adoption of harmful methods, and so forth; *cf.* the Fishery Chambers described in paragraphs 116–122 of the Note on Fisheries. These associations are not of modern date—especially in the silk industry—except in their present form which is regulated by the revised law of March 1900. This law limits the objects of association as mentioned above, requires that two-thirds of the persons engaged in a given industry within the limits of a proposed association, shall give their consent before its formation, and that when an association has been formed every person exercising that industry within its territorial limits *shall* join the association, unless specially exempted by the Minister. The associations may also confederate to form a Union. The officers of the Association or Union may examine the products or goods of any member according to rules laid down for the purpose, in order to ensure the quality of the goods, and may mark or brand them in token of quality; goods which transgress the rules or standards of the Association may be confiscated and the member may be fined. Annual reports must be drawn up, and while the Associations are entitled to make suggestions to the authorities they must also be prepared to give any necessary information. The Government may break up any association for misconduct or acts either illegal or harmful to public interest. The rules of an association must, of course, provide for the standards, etc. by which commodities will be judged.

194. These important Trades Associations numbered 375 at the end of 1904 embracing 67 industries; of these 102 are said to be silk associations, 43 relate to grain produce, 10 to the manufacture of straw plaits, 16 to grass mats, 15 to wood and timber, 5 to fertilisers, 3 to indigo, etc. Hence agriculture is well represented.

195. Besides the above three classes of Association there are regular joint stock *agricultural* companies, which at the end of 1904 numbered 180 with an authorised capital of Rs. 42·6 lakhs, of which 31·6 had been paid up; reserves were Rs. 1·2 lakhs. Of these the most important were 24 companies for opening up waste (wild) land; these had an authorised and paid-up capital of 13·9 and 11·5 lakhs respectively; there were also 15 forestry companies (10·8 and 7·5 lakhs), 10 farming companies (4·5 and 4·1 lakhs), besides companies for silk (63), dairy (24), stock farming (24), nursery (14), mulberry, etc. (6).* There is much that might be done in the agricultural line by companies or societies in the Madras Presidency, *e.g.*, in irrigation by pumping, in reclaiming, planting and improving waste lands, etc.

196. The last class of Association to be mentioned is the "Agricultural Society of Japan" more or less corresponding to the Royal Agricultural Society of England; this is wholly unofficial and consists of persons generally interested in agriculture; it was founded in 1872, under direct Imperial auspices, by a Japanese gentleman who had travelled abroad and in consequence of what he had learnt abroad; it has now 8,000 members with several branch societies, and its monthly Journal, scientific and practical, has an issue of 7,000 copies besides the half-yearly reports. The members' subscription is Rs. 3–8 per annum. Various great landowners are interested in its work which, *inter alia*, embraces the upkeep of a High School where students are taught agriculture preparatory to the College, and whose graduates become school teachers, officials of Agricultural Associations, farmers, etc.; each year 30 or 40 pass, and the school is now being largely developed; the school has a 6-acre farm, all necessary laboratories, and practical teaching, the farm work being done by the students; the course is one of three years. The Society supports annual Agricultural shows besides itinerant exhibitions and competitions of implements, itinerant lecturers, general congresses, conferences on special subjects of farming

* There were also 58 companies for fishery purposes, with an aggregate capital of Rs. 24·5 lakhs, of which no less than 12 were for fish culture with a capital of Rs. 3·5 lakhs. These do not include the cannery, fish oil, etc., companies which come under the head of manufactures. The above companies were omitted from my Note on Fisheries.

and rural economics, etc., and makes suggestions to Government and others on agricultural progress; its work seems to deal rather with the general economics of agriculture than with its technique. Meetings of members in the districts are held frequently, and four times per annum in Tokyo; prizes are given for the best essays on agricultural subjects; advice is readily given to all members; and special lecturers are sent on request to any agricultural meeting. It has no direct connection with the more official Associations based on the revised law of 1905, but its work assists and stimulates their work in several directions, many of its members belonging to both classes of Association; in fact the society had established various associations, but they took on a character which the society did not contemplate, and separation ensued. The Secretary, from whom the above particulars were gathered, considers that the various Agricultural Associations are the cause of much recent progress, including the new and very large demand (above two million sterling last year) for foreign fertilisers not produced in Japan.

It is believed that there are other such societies in Japan, but no information has been gathered about them. It will be seen that Japanese agriculturists and landowners did not wait for Government suggestion, but led the way; they themselves, especially after travel, saw the need for progress and the benefits of association, and their society, like the Fisheries Society of Japan, is an instance of Japanese *national* foresight and instinct for self-help.

MORTGAGE BANKS.

197. State effort, however, was further directed to the financing of agriculture, for which purpose Government encouraged the formation of a joint stock "Hypothec" (mortgage) bank at Tokyo in 1884, and in 1896 the establishment of smaller local banks with similar objects, one in each district, so that they might be nearer to the farmer. These classes of agricultural bank were adapted from European practice such as the Crédit Foncier, the German Hypotheken Banken, etc.; these prototypes have been mentioned in the Madras "Report on Land and Agricultural banks." The Tokyo bank need not be here described, as it deals only with large loans, and does not touch the farmer; it is indirectly useful in that it is permitted to cash the debentures of the district banks. These latter, though not yet successful in their primary object of financing the peasant farmer, merit description. The sphere of operation of each bank is the district in which it is situated (averaging about one million inhabitants); the following official description recites their objects and methods:—

"The Local Hypothec Banks are joint-stock companies with a capital of not less than 200,000 yen (Rs. 3 lakhs). As set forth in the explanation of the law relating to the Local Hypothec Banks, the latter aim at supplying funds to farmers of the middle and lower classes, and even to make loans on credit when applications come from organized bodies. These banks number 46 in all, and are also subject to the supervision of the Minister of Finance, and enjoy in return no small assistance from the Treasury. The loans to be made are restricted to the following objects:—

1. Reclamation of land, irrigation, drainage and improvement of the fertility of the soil.
2. Construction and improvement of farm roads.
3. Settlement in newly reclaimed places.
4. Purchase of seed, young plants, manure and other materials required in agriculture and industry.
5. Purchase of implements and machines, boats, waggons and beasts for use in farming and manufacture.
6. Construction or repair of building for use in farming and manufacture.
7. Improvements in farming and manufacture not included in the foregoing clauses.
8. Adjustment of farm lands.
9. Undertakings by Credit Guilds, Purchase Guilds, and Produce Guilds, of unlimited liability and organised under the Industrial Guilds' Law.

The loans to be made for the foregoing objects are under these conditions:—

LOANS.

Loans on Real Estate.

1. Payments by yearly instalments.	Within thirty years.
2. Payments within fixed period	Within five years, the aggregate sum of the loans not to exceed one-fifth of that of loans payable by instalments.

Loans on Credit.

1. Payment by yearly instalments.	Within thirty years.
2. Payments within fixed period	Loans payable within five years; and loans with no such restriction.

Loans on credit and payable by instalments can be made only to municipal corporations, towns or villages, and public

bodies organized under law, while loans on credit with payment within fixed period may be only under these conditions :—

Repaid within five years.

(1) To municipal and other civic corporations or public bodies organised under law.

(2) To joint application from not less than 20 persons who are judged thoroughly trustworthy and who are engaged in agriculture or manufacture.

(3) To Credit Guilds, Purchase Guilds, and Produce Guilds of unlimited liability."

198. Loans on immoveable property may not exceed two-thirds of its value as appraised by the bank. A bank is authorised as soon as one-fourth of its capital has been paid up, to raise mortgage debentures to an amount not above five times its paid-up capital, not exceeding however the total amount of those outstanding loans which are repayable by instalment; debentures are redeemed by half-yearly drawings according to the amount of loans repaid, and premia are awarded by lot to a certain proportion of the debentures so drawn. The Imperial Government aids the banks by taking shares through the prefects; the amount of such shares may not exceed Rs. 105 per 245 acres of taxable land in the district, nor Rs. 4½ lakhs per district nor one-third of the paid-up capital of the bank. The exact amount of shares taken has not been ascertained but is considerable; to a similar bank in the Hokkaido the Government actually subscribed Rs. 15 lakhs the dividends on which are, for ten years, to be added to the reserve.

199. These banks however, appear to have entirely failed to get down to the peasant farmer; the official remark in 1903 was that "the farming classes are as yet unable to enjoy to any satisfactory extent the benefit accruing from these facilities, chiefly because most of our farmers possess only limited means at their disposal and because loans are necessarily accompanied by elaborate processes"; in other words farmers, of whom 85 per cent. hold less than 3¾ acres, cannot provide business worth the attention even of district banks, at least so long as better business, in the shape of large and perfectly safe loans to corporate bodies, is available.

200. A glance at the figures in the Fifth Financial Report (1906) shows this plainly enough. The aggregate authorised capital of the 46 local banks was, in 1904, about Rs. 428 lakhs of which Rs. 417 lakhs were paid up; at the close of the year the deposits were Rs. 82·5 lakhs, the outstanding debentures were nearly Rs. 39 lakhs, and the outstanding loans of all classes were Rs. 444 lakhs. Now the banks had then been fairly at work for seven years, viz., from 1898, so that the minimum period loans (five years)

began to be repaid from 1903, in which year, as in 1904, the repayments on all loans amounted to about one-fifth of the total outstanding advances; hence it is clear that the bulk of the loans are only five-year loans and are not the thirty-year mortgage loans expressly intended for the farmer who, as the statement of objects and reasons of the law of 1895 declares, needs funds for operations on which profit does not come in for ten or twenty years. Since, also, the five-year loans grantable to farmers on their estates cannot exceed one-fifth of the amount lent on long instalment loans, and as these latter are obviously very few, it follows that individual farmers practically get nothing out of the banks; it is probably the corporate bodies (especially municipalities, towns, and communes, which had increased their total loans from Rs. 200 lakhs in 1897 when the banks began work, to Rs. 944 lakhs in 1904) that have absorbed the funds of the district banks.

201. The fact is that, so far, exclusive of direct Government loans which are neither very successful nor possible, only two ways have been discovered of financing the small peasant farmer; one on the European Continent by village banks of the Raiffeisen or Schultz-Delitzsch type, financed at first from private funds (either members' deposits and loans or from outside) or from various banks (popular, savings, joint stock, etc.), until they are numerous enough to support central lending banks of their own; the other, in Egypt, on a plan modified from the Scotch banks, where a rich central bank organises a great lending system through numerous inspectors and is permitted to use both the Government village organisation, village knowledge, village land records, and local treasuries, for the issue and recovery of its loans. The former is, in the writer's opinion, decidedly preferable as it fosters self-help and avoids Government intervention; the Egyptian plan both requires higher interest, is a quasi-Government organisation, and is apt to prevent the formation of local credit associations; under certain circumstances the second plan, however, is unavoidable especially where money is needed for more than current wants. But it has been proposed for India that the second plan should be modified by the central bank lending to associations or groups of farmers; it is necessary for such banks to begin by lending largely to individuals in order to create a clientèle and a business which will pay dividends during the slow process of forming associations, but when the latter are formed, business should preferably be done with them, and Government might allow privileges to further such business. It is this very plan to which the Japanese are seemingly working, for the Government have fostered the formation of Agricultural Guilds to which mortgage banks will lend; among the declared objects of the banks' operations is the lending to groups of at least

20 agriculturists (artisan, etc.) combined in joint liability, or to Credit and Produce Guilds with unlimited liability without any other security than that of such joint liability. These Credit Guilds have been described above and resemble the German Village and Peoples' banks.

SUPERVISION OF FERTILISERS.

202. It is needless here to give the several reasons why, when new fertilisers are being advertised and pushed, the small farmer needs assistance and protection; assistance in telling him the constituents, value, and methods of use of such new fertilisers, and protection against fraud. The experimental stations and associations are teaching him the value in use and the methods of use, but there was nothing to tell him the precise value of a consignment or the cheapest way of obtaining a particular element. Hence, after a certain district officer had experimented by compelling local manure dealers to form a responsible guild, Government passed a law for controlling fertilisers, according to which every manufacturer or dealer in manures must be licensed, and the prefect can at any time send an inspector to inspect the premises or to take samples from stock for examination; the penalty for manufacturing or wilfully selling adulterated manures is imprisonment for a period which may extend from 15 days to one year or with fine up to Rs. 450, and the adulterated goods shall be confiscated. Rules under the law prescribe that the applications for license shall give full particulars, material, etc., of the manure to be manufactured or sold, and that any modifications shall be reported; that every bag or parcel of manure shall bear a label with the name and address of the manufacturer or seller, and the percentage of manurial elements which it contains; this applies to superphosphates, salts of nitric acid, ammonia, potash and other chemically manufactured fertilisers; to bone meal and ash, dried meat meal, dried blood, Thomas's phosphates and other artificially ground manures; to rape and cotton seed cake; and to mixtures of the above. Nitrogen shall be expressed in terms of nitrogen, or nitric acid salts, or ammonia, and phosphoric acid as phosphoric acid, *ditto* soluble in water, and *ditto* soluble in ammonium citrate. Proper books of sale must be regularly kept by manufacturers and dealers showing name and address of purchasers, manure sold, etc.; these books shall always be open to inspection by the proper inspectors and an annual report must be made by every dealer to the prefect showing the kinds, quantities, and values of all manures sold in each shop. It will be seen that Government is fully alive to the necessity for pure fertilisers of stated

composition. For the enforcement of this law Government have appointed above 100 inspectors for work in the several districts and have also appointed chemists at the various experimental stations for analytical purposes which, indeed, is a regular item of station work; the cost of these special officers in 1903 is stated as Rs. 1,35,000 and Rs. 57,900 respectively.

203. Here this sketch of certain features of Japanese agricultural practice and rural economy, both original and modern, must, for the present, end; it is hoped shortly to issue a revised note with the addition of suggestions for Madras based on the hints and examples provided for us in Japan as contained in the above; the press of other occupations especially that of fisheries work and the travelling incidental to it, have hitherto negatived efforts to issue the suggestions with the note itself.

F. A. Nicholson.

31*st March* 1907.

APPENDIX I.

LIST OF TRANSLATIONS—AGRICULTURE.

(1) Ordinance of 1905 relating to Agricultural Associations.
(2) Rules for giving effect to (1).
(3) Specimen Rules for Temporary Schools and Experimental Farms established by an Agricultural Association.
(4) Ordinance of the Department of Agriculture and Commerce on statistics to be supplied by Agricultural Associations.
(5) Ordinance of the Department of Agriculture and Commerce on improvements to be recommended by Associations to their members.
(6) Regulation of 1899 relating to Prefectural Experimental Stations of Agriculture.
(7) Regulation of 1899 relating to Prefectural Farms Schools.
(8) Law of 1900 (90 sections) relating to Industrial Guilds (Sangio-kumiai); applicable to Agriculture.
(9) Rules for giving effect to (8).
(10) Regulation of 1884 governing Trade Associations (Dogyo-kumiai); applicable to Agriculture, Fishery, etc.
(11) Instructions (Department of Agriculture and Commerce) relating to (10).
(12) Law of 1900 for Associations of Trades in Staple Products (Juyo-bussan-Dogyo-kumiai).
(13) Rules for giving effect to (12).
(14) Law of 1896 governing the Japan Mortgage Bank.
(15) By-laws of (14).
(16) Law of 1896 governing Local (Prefectural or District) Mortgage Banks; with statistics and a report.
(17) Law of 1896 governing the grant of State funds to Local Mortgage Banks; with statistics.
(18) Rules of 1900 relating to the grant of Government subsidies to Agricultural Associations.
(19) Law relating to Government subsidies for experiment and instruction on industries.
(20) Statistics of such grants (Agriculture and Fishery for 1905).
(21) Law of 1899 regulating the manufacture and sale of manures.
(22) Rules of 1901 for giving effect to (21).
(23) Agricultural Associations in Japan.
(24) Operations, and Financial Statements, and programme of a specimen Prefectural Association.
(25) Articles of the same.
(26) Articles of a County (taluk) Association.

(27) Articles, etc., of an Agricultural Union of Village Agricultural Associations.
(28) Report of 1903 of a County Agricultural Association.
(29) Resolutions of a Conference in Tokyo regarding the best forms and methods of using Village Agricultural Associations, their difficulties, operations, and relation to other institutions such as schools, officials, religion, etc.
(30) Reports of Various Village Agricultural Associations.
(31) Articles of Village Agricultural Association.
(32) The "Japan Agricultural Society"; history of work done from 1881 (foundation) to 1893; abstract of Articles; description of special conferences, competitions, and exhibitions; establishment of Annual National Council of Agriculture, etc., etc., etc.
(33) Experimental Stations—statistics and description of objects.
(34) Report of a Council of Directors of Agricultural Experimental Stations.
(35) Report of a specimen Station.
(36) Description of kinds of Agricultural Schools with statistics of 1904 and 1905.
(37) Reports of (1904) of two "A" class Schools of Agriculture and Forestry.
(38) Regulations by Government for the establishment, maintenance, etc., of Agricultural Schools of "A" and "B" classes.
(39) Statistics of Industrial Guilds (Agriculture) to end of 1904.
(40) Description and Report of a Village Industrial Guild (Agricultural Credit Association).
(41) Description, etc., of a Co-operative Guild for joint sale of goods.
(42) Description, etc., of a Co-operative Guild for purchase of manures.
(43) Statistics of Trade Associations (Dogyo-kumiai) in 1905.
(44) Certain scientific papers relating to agriculture.
(45) Agricultural papers from periodicals.
(46) Miscellaneous.